FINAL REPORT

I-65 FREEWAY INCIDENT MANAGEMENT STUDY

NOTE TO READER:

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KENTUCKY TRANSPORTATION CABINET

HNTB

Architects
Engineers
Planners

FINAL REPORT

I-65 FREEWAY INCIDENT MANAGEMENT STUDY

AUGUST 1994

in association with
PRENELL ASSOCIATES INC

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KENTUCKY TRANSPORTATION CABINET

AUGUST 1994

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PREFACE

Traffic congestion continues to increase in the United States, particularly in metropolitan areas. It is estimated that annual delay due to congestion is more than two billion hours, at a cost exceeding $16 billion per year. The Federal Highway Administration (FHWA) has estimated that nearly 60% of this delay is due to incidents.

Incidents are random events, such as accidents or disabled vehicles, which reduce the effective capacity of a roadway. These events are particularly disruptive when a roadway is operating near capacity. On a three-lane freeway (such as I-65 in Louisville), an accident on the shoulder causes a capacity reduction of about 15 percent. Blockage of one travel lane on a three-lane freeway reduces the effective roadway capacity by half.

At higher traffic volume levels, a queue forming behind the blockage can take an extended period of time to dissipate. A study conducted by the California Department of Transportation (CALTRANS) indicates that each minute of blockage results in five minutes of motorist congestion.

These statistics highlight the need for effective incident management, which is a preplanned and coordinated program to detect and remove incidents and restore roadway capacity as quickly and safely as possible. Incident management systems include an array of strategies to improve incident detection and verification, response time, site management, clearance time, and motorist information.

This study provides short- and long-range recommendations for an incident management system for I-65, generally between Fern Valley Road in Kentucky and SR 3 11 in Indiana. There were over 1,000 accidents and as many as 7,000 incidents on this section of I-65 in 1993. Traffic volumes on this section of I-65 are among the highest in Kentucky, up to 135,000 vehicles per day. Most importantly, this study section includes the Kennedy Bridge, a six-lane structure which is one of only three which link Louisville to Southern Indiana.

I-65 capacity and safety improvements are planned in Southern Indiana, but significant capacity increases on I-65 in Louisville are unlikely due to high cost and right of way limitations. It is essential that the existing facility be operated in the most efficient manner. To respond to this need, the I-65 Incident Management Task Force was organized by the Kentucky Transportation Cabinet in 1991. This group was instrumental in the development of this study.

Meetings were held with Task Force members on a monthly basis between August 1993 and June 1994 in support of this study. (The January 1994 meeting was canceled due to the unprecedented snow emergency in Louisville.) The active participation of Task Force members was a key element in the preparation of this report. More importantly, however, their involvement marked the beginning of an ongoing process to provide improved incident management in the Metropolitan Louisville area. With the continued cooperation and commitment of Task Force members, the strategies recommended in this report will improve safety, reduce congestion, and provide significant user cost benefits for all motorists on I-65.

I-65 Freeway Incident Management Task Force Meeting Participants

Kentucky Transportation Cabinet (KyTC)
- Bill Seymour
- Leon Walden
- Bob Flener
- Sherrill Smith
- Lonnie Yates

Indiana Department of Transportation (INDOT)
- Jim Poturalski
- Ed Cox (Central Office)
- Mark Newland
- Jim Barr
- Steve Wuertz
- Michael Hofmann
- Ed Cox (Seymour District)

Federal Highway Administration (FHWA)
- Mark Bartlett
- Glenn Jilek
- Paul Toussaint
- Paul Doss
- Robert Farley
- Grant Zammit

Kentuckiana Regional Planning and Development Agency (KIPDA)
- Norm Nezelkewicz
- Dan Cole

Louisville Division of Public Works
- Jim Pasikowski

Jefferson County Division of Public Works
- Mark Adams

Transit Authority of River City (TARC)
- John Woodford
- Lea Rafferty

Louisville Division of Police
- Glenn Woods

Jefferson County Police
- Bill Howard
- Daniel Borden

Kentucky State Police
- Ron Allgood

Indiana State Police
- Marvin Jenkins
- Jim Hickerson

Louisville Fire Department
- Larry Mialback
- Wayne Schmidt

Louisville Emergency Medical Services (EMS)
- Dick Bartlett

Jefferson County Emergency Medical Services (EMS)
- Paul Evans

Louisville/Jefferson County Disaster and Emergency Services (DES)
- Bud Fekete
- John Nevin

Kentucky Disaster and Emergency Services
- Charlie Frazee

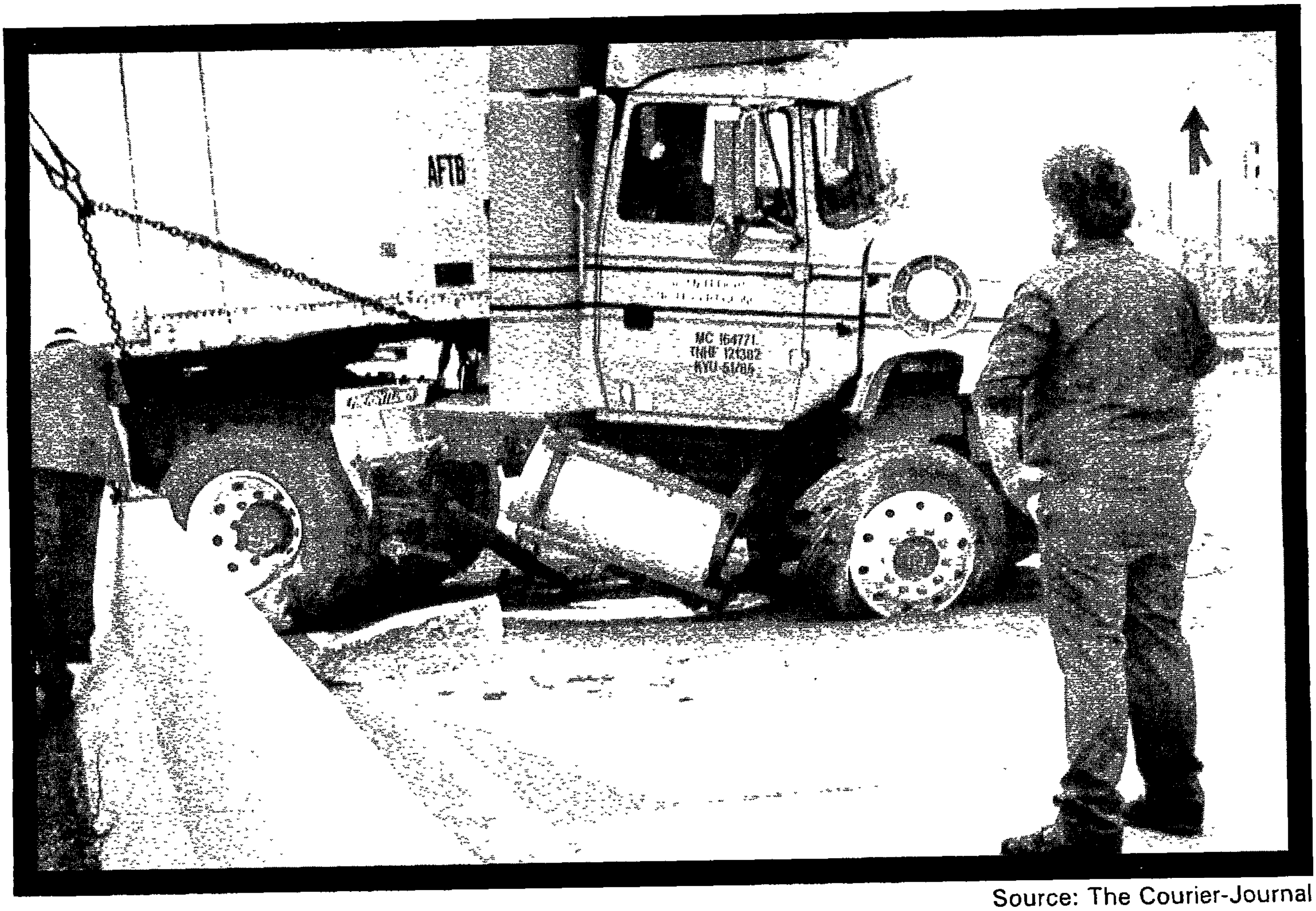
Jeffersonville City Services
- Leslie Kavanaugh

WHAS Radio
- Ron Robertson

Kentucky Fair and Exposition Center
- Dan Scholl

Kentucky Transportation Center
- Jerry Pigman

1. INTRODUCTION



Source: The Courier-Journal

September 4, 1993

Semi- trailer jackknifes on I-65 near Eastern Parkway, damaging median and blocking traffic in both directions.

1. INTRODUCTION

1.1 Intelligent Vehicle Highway Systems

The Inter-modal Surface Transportation Efficiency Act of 1991 (ISTEA) established a new emphasis in transportation system policy in the United States. This legislation focused on the need to increase the efficiency and safety of existing transportation facilities. The realities of public finance and increasing mobility of society dictate that we maximize the benefit from our transportation investment.

Several initiatives were launched to research, develop, test, and promote intelligent vehicle highway systems (IVHS) in the United States under Title VI, Part B of ISTEA (the IVHS Act of 1991). This legislation has led to the development by FHWA of guidelines and support for planning and deployment. Although elements of IVHS have been in use for many years, their application was confined to highly congested urban areas. Only in recent years, as a greater number of cities began to experience congestion, has IVHS been considered as a viable solution to this nation's traffic problems.

Although IVHS generally refers to the hardware and software used to manage traffic and inform motorists, IVHS system deployment involves more than technology. The term IVHS deployment has come to represent an overall strategy which is aimed at increasing the efficiency of the transportation system. This is accomplished by improving coordination among agencies, monitoring system conditions, informing system users, and applying effective management techniques to improve system operations.

A major function of most IVHS systems is improved management of incidents. Current incident management systems make use of a wide array of techniques to improve our ability to recognize and respond to highway incidents. Characteristically, these systems provide favorable benefit/cost ratios due to the extensive benefits provided to highway users.

Incident management strategies also emphasize non-technical solutions, such as better coordination and understanding among emergency responders, and preplanning for major incidents. (In Louisville, the value of preplanning and agency coordination is demonstrated very effectively on an annual basis when the Kentucky Derby is held during May.)

1.2 Study Purpose

The purpose of this study is to establish a concept plan for a freeway incident management system to serve I-65 within the Metropolitan Louisville area, from SR 311 in Indiana to Fern Valley Road in Kentucky. Also included in this concept plan is the section of I-264 (Watterson Expressway) near the Kentucky Fair and Exposition Center, Standiford Field, and Churchill Downs. Depicted in Figure 1.1, the study area is approximately 15 miles long.

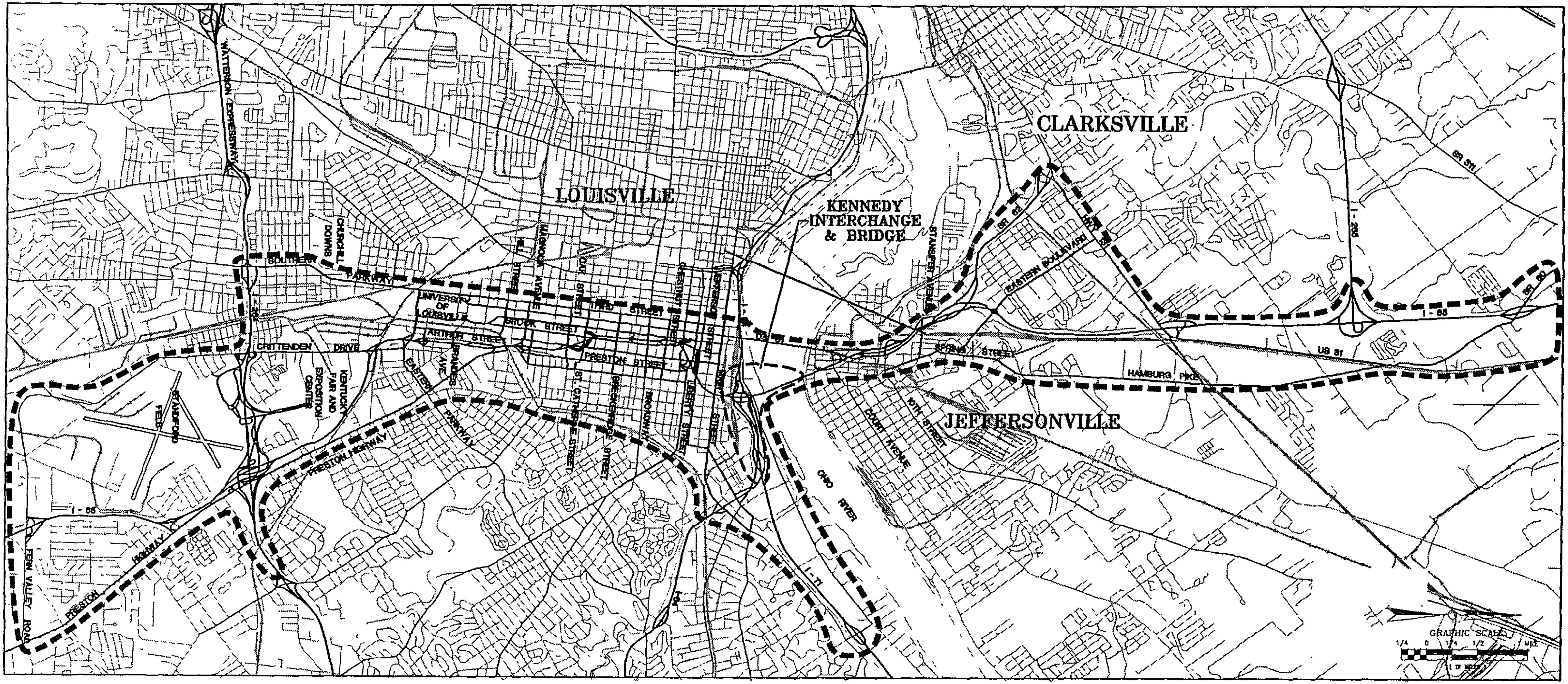


FIGURE 1.1
STUDY AREA

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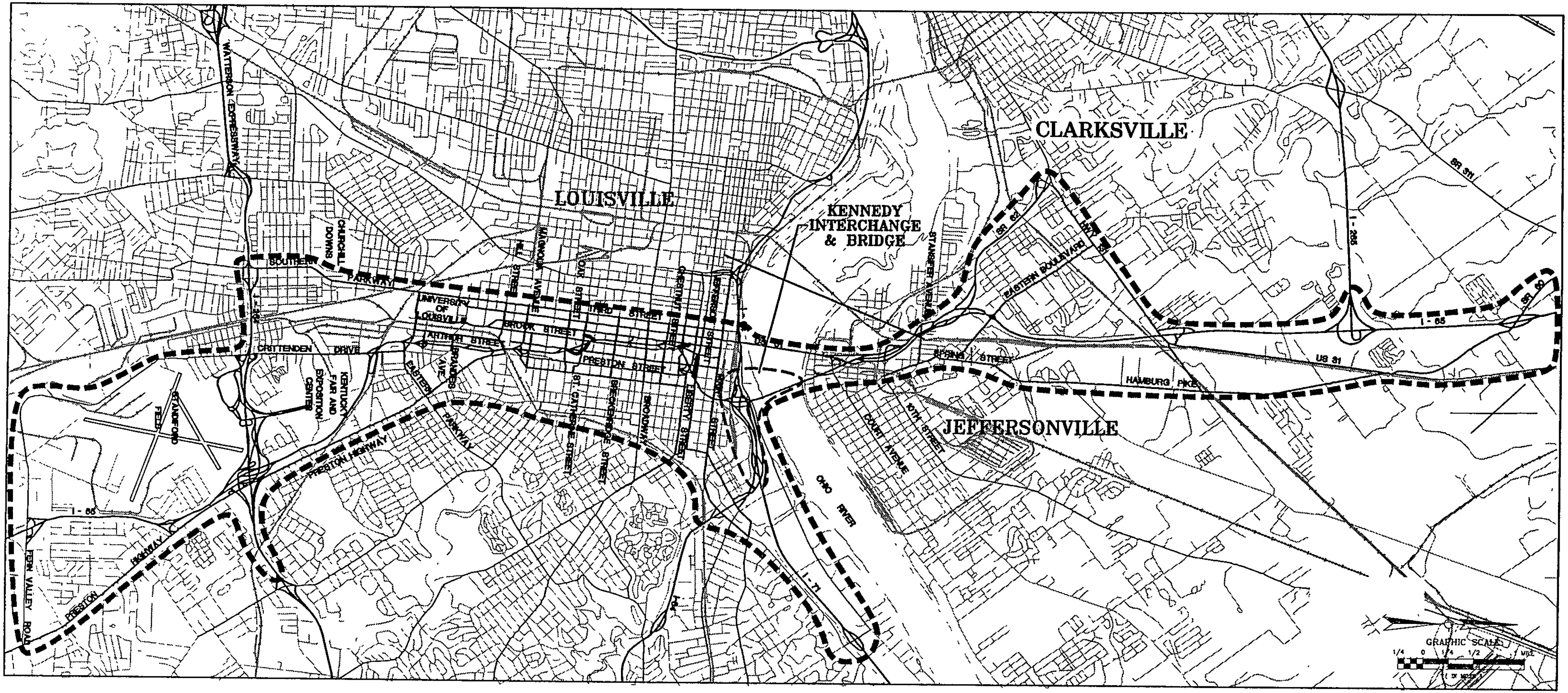

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FIGURE 1.1

STUDY AREA

A number of groups and agencies involved with transportation and emergency response in the Metropolitan Louisville area have participated in developing this plan. Continued participation will be essential if the system is to be effective.

In addition to identifying the most appropriate set of incident management system components, the concept plan establishes procedures for effective incident response, provides a plan for implementation, and begins to define relationships among involved groups and agencies.

1.3 Plan Process

At the beginning of this study, a number of questions were identified to be answered during the study process. In addition to providing a base for development of the incident management system recommendations, these questions provide an overview of the intent of the plan. The questions include the following:

1. What are the most significant problems and opportunities associated with the existing and planned freeway system of the Metropolitan Louisville area?

2. Which freeway incident management strategies are likely to be most effective in addressing system problems or taking advantage of opportunities for improvement?

3. What components and procedures are recommended to accomplish the identified freeway incident management strategies?

4. What are the likely costs, benefits, and impacts of implementing recommended freeway incident management strategies, and what are the specific steps for advancing the project from recommendations to operations?

5. How can affected groups, agencies, and institutions interact most effectively in implementing and operating the freeway incident management system?

Properly designed and implemented, the I-65 Freeway Incident Management System will facilitate early detection, prompt response, safe and quick removal, and proper management of incidents along and around the I-65 corridor in the Metropolitan Louisville area. In developing an incident management plan, it is important to understand the number of incidents, the cause of incidents, and the impact on traffic flow and improvements that may alleviate these impacts. These elements are addressed in this final report.

1.4 Goals, Objectives, and Measures of Effectiveness

Site-specific issues need to be considered in developing goals and objectives for an incident management system. Goals, objectives, and measures of effectiveness in this study were developed following initial data gathering activities and interviews with incident response personnel.

A goal is a succinct statement of the fundamental purpose of a process. Goals have been established for this study and for the system, itself. The goal of this study is stated below:

> STUDY GOAL: To identify a system of components and actions which, when taken together, will improve travel time and efficiency of the roadway system, reduce the severity of accidents and personal injury, and better inform motorists of unusual or unanticipated conditions.

The study goal provides an overall direction for the study and a "checkpoint" to see that recommendations serve the fundamental purpose of the project.

Goals for the incident management system are broken down into a number of categories, which are listed below:

System Goals

Overall Goal:	*Minimize the effects of incidents on I-65 to users and providers.*
Environment Goal:	*Reduce transportation system impacts of incidents.*
User Cost Goal:	*Minimize travel costs associated with incidents.*
Traffic Goal:	*Increase efficiency of I-65 travel corridor.*
Institutional Goal:	*Increase efficiency of incident management process.*
Informational Goal:	*Increase comfort and convenience of travel.*

Objectives provide a more detailed definition of purpose. This is necessary to identify strategies and support selection of individual system components. Ordinarily, objectives are more measurable than goals. Objectives often relate to more than one goal.

Objectives

Improve air quality
Reduce fuel consumption
Reduce user delay
Increase capacity of existing system
Improve safety of travel
Improve cooperation between transportation system operators
Improve communication with system users

Measures of effectiveness (MOEs) are used to define the success or failure of a strategy or system component in accomplishing system objectives. By definition, measures of effectiveness are quantifiable.

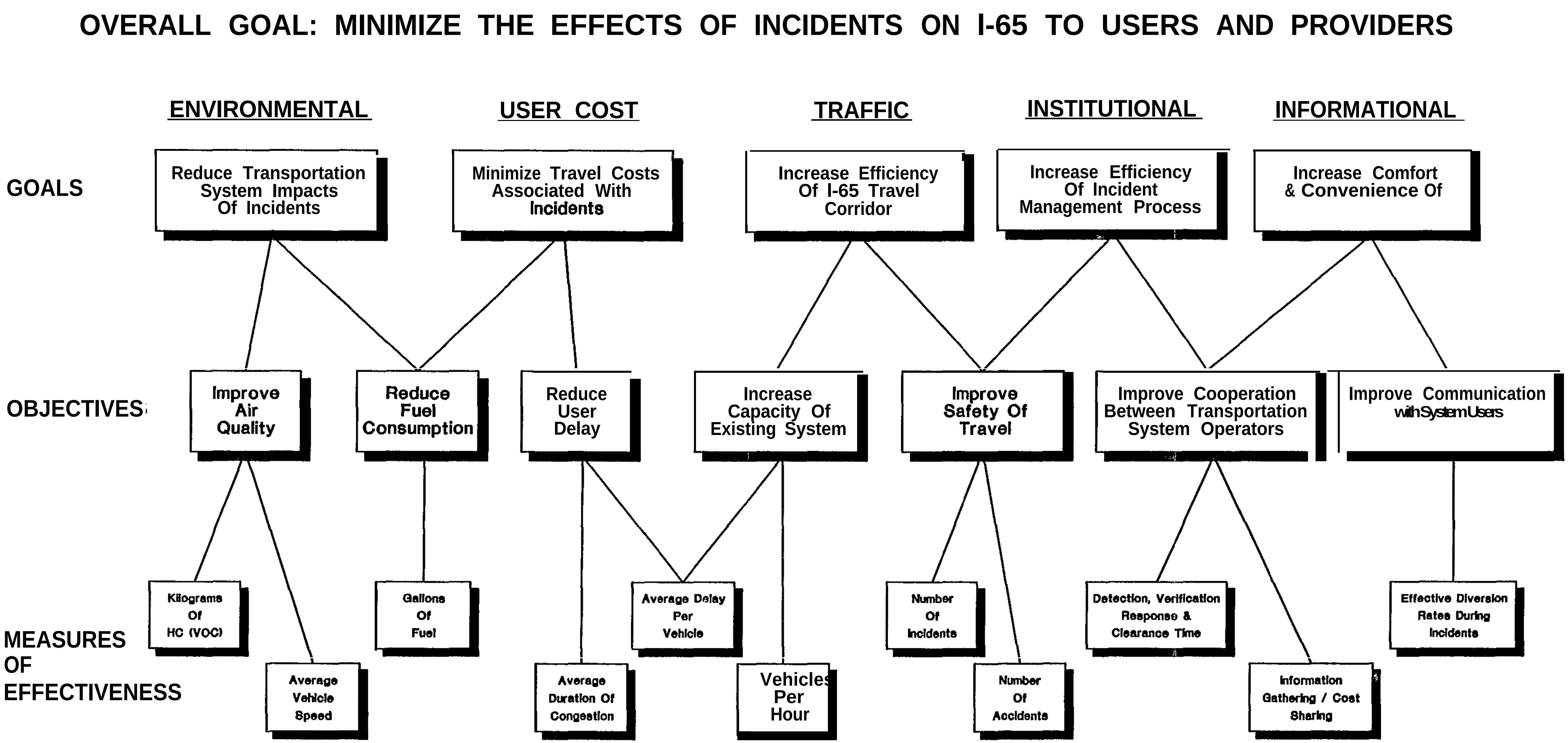
Measures of Effectiveness

Kilograms of hydrocarbons (volatile organic compounds - VOC)
Average vehicle speed
Gallons of fuel
Average duration of congestion
Average delay per vehicle
Vehicles per hour
Number of incidents
Number of accidents
Detection, verification, response, and clearance time
Information gathering/cost sharing
Effective diversion rates during incidents

The relationships of goals with objectives and measures of effectiveness are illustrated on Figure 1.2. The range of goals, objectives, and measures of effectiveness presented for the system illustrates the broad benefit expected and available from its implementation. It is this broad benefit which has prompted extensive interest in incident management systems across the United States.

1.5 Incident Management Task Force Review

The goals, objectives, and measures of effectiveness presented here have been reviewed in draft and final form with the I-65 Incident Management Task Force supporting this study. They agreed that the material presented would provide a suitable framework for investigations and recommendations of plan development.



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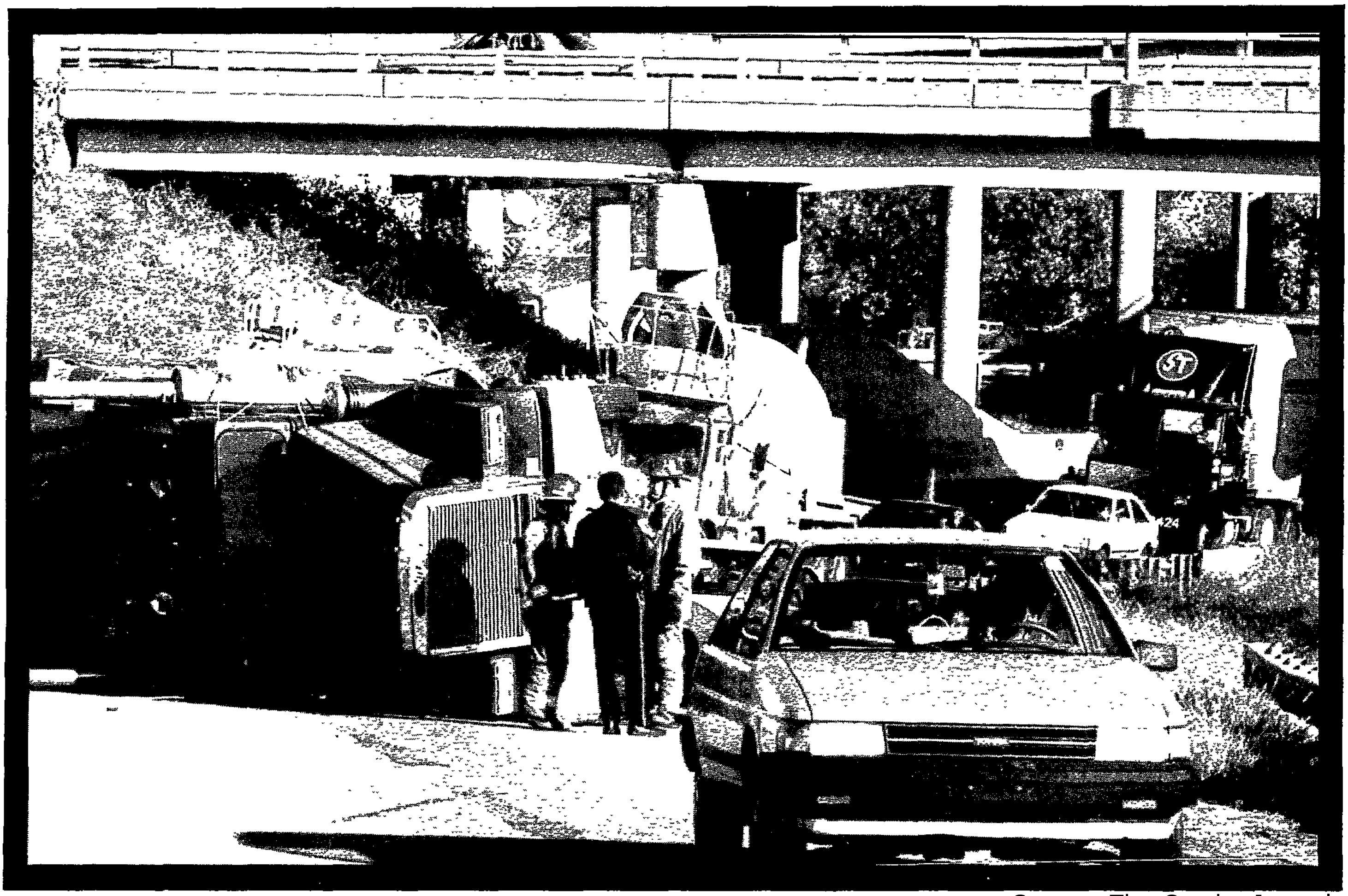
SOURCE
-HNTB, 1993

FIGURE 1.2

GOALS, OBJECTIVES, AND MEASURES OF EFFECTIVENESS

2. EXISTING AND FUTURE CONDITIONS



Source: The Courier-Journal

October 22, 1993

Tractor-trailer overturns on I-71 westbound ramp to I-65 southbound.

2. EXISTING AND FUTURE CONDITIONS

This section presents the background information collected during the early stages of this study. In addition to the summaries of traffic, accident, and incident data, a discussion of the special facilities along I-264 is also presented.

2.1 Roadway Facility Characteristics

I-65 was designed and constructed as one of the early segments of the interstate system. Its geometric characteristics reflect common practices of the 1950's, including closely spaced ramps, short merge/diverge sections, and steep ramps at some locations. At the center of the study area is the Kennedy Bridge. This six-lane structure is one of only three highway bridges spanning the Ohio River in the Metropolitan Louisville area.

In Kentucky, most reasonable actions to improve safety and capacity of the existing roadway have already been taken. Additional geometric improvements are currently not anticipated on Kentucky sections, with the possible exception of the Kennedy Interchange, located just south of the Kennedy Bridge. Options to improve this interchange are currently being reviewed by the Kentucky Transportation Cabinet.

The Indiana Department of Transportation has plans to reconstruct I-65 within the study area providing a collector-distributor (C-D) system along each side of the roadway and adding mainline capacity. Currently in the design phase, these improvements will significantly improve the capacity and safety of Indiana sections. Ultimately, the C-D roadways will provide options to mainline travel for incident management or maintenance activities. Maintenance of traffic during construction, however, will be complex and difficult. The first phase is programmed for construction during the period of 1996-1998, and the entire project may take as long as 10 years to complete.

I-65 has a six-lane cross section from 10th Street in Indiana to Crittenden Drive in Kentucky. Southbound between the Kennedy Interchange and the Watterson Expressway, I-65 contains 14 total ramps (nine on-ramps and five off-ramps). Ramp spacing is less than 2,500 feet gore to gore. Northbound in the same section, there are 13 ramps (five on-ramps and eight off-ramps). Ramp spacing is less than 3,300 feet gore to gore.

In Indiana, a frontage road currently exists on both sides of I-65 from Court Avenue to SR 62. I-65 joins with US 31 on this section. Additional connections are provided to 10th Street, Stansifer Avenue, Eastern Boulevard, SR 131, and I-265. Ramp spacing varies from 500 feet to 1,000 feet on the frontage road. North of SR 62, interchange spacing is 8,000 feet from Eastern Boulevard to US 31/SR 131, and 5,500 feet from US 31/SR 131 to I-265. There are 28 ramps on this section, including those to and from the frontage road.

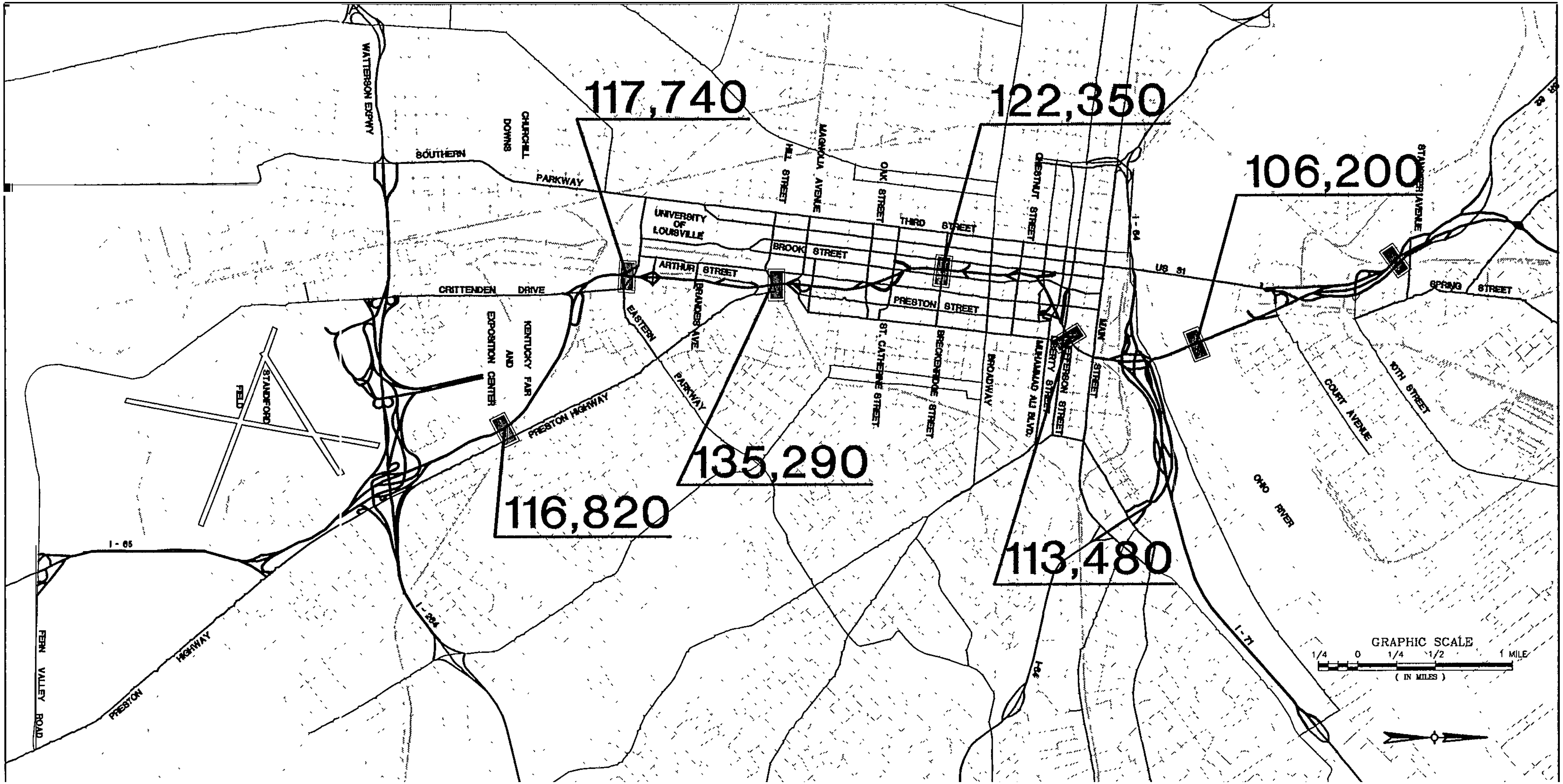
2.2 Existing Traffic Volumes

To identify existing traffic volumes in Kentucky, counts were completed for this study using 24-hour mechanical traffic counters at 31 locations along I-65 between the Kennedy and Watterson interchanges. The counts were taken at selected mainline locations and at all exit and entrance ramps in both directions. The data were summarized and analyzed to develop representative existing average daily traffic (ADT) volumes. Indiana traffic count data from 1992 was provided by INDOT. Figures 2. la and 2.lb summarize the existing traffic volumes for Kentucky and Indiana .

Morning and afternoon peak-hour volumes were also identified and plotted for each mainline and ramp location. For Indiana, this data was taken from INDOT's 1991 "I-65 Study: Ohio River to SR 311." The results are shown in Tables 2.la and 2.lb.

Traffic counts on I-65, I-64, and I-71 within the Kennedy Interchange were gathered in 1993 in support of the Kennedy Interchange Study. Estimated daily traffic volumes on those sections are shown on Figure 2.2.

A review of existing traffic count information indicates that the highest I-65 traffic volumes in the study area occur near the Kennedy Bridge in Indiana and near the University of Louisville in Kentucky. I-65 volumes in Kentucky exceed 110,000 vehicles per day through most of the study area. As indicated in later sections, peak-hour traffic volumes are near the capacity of a six-lane freeway.



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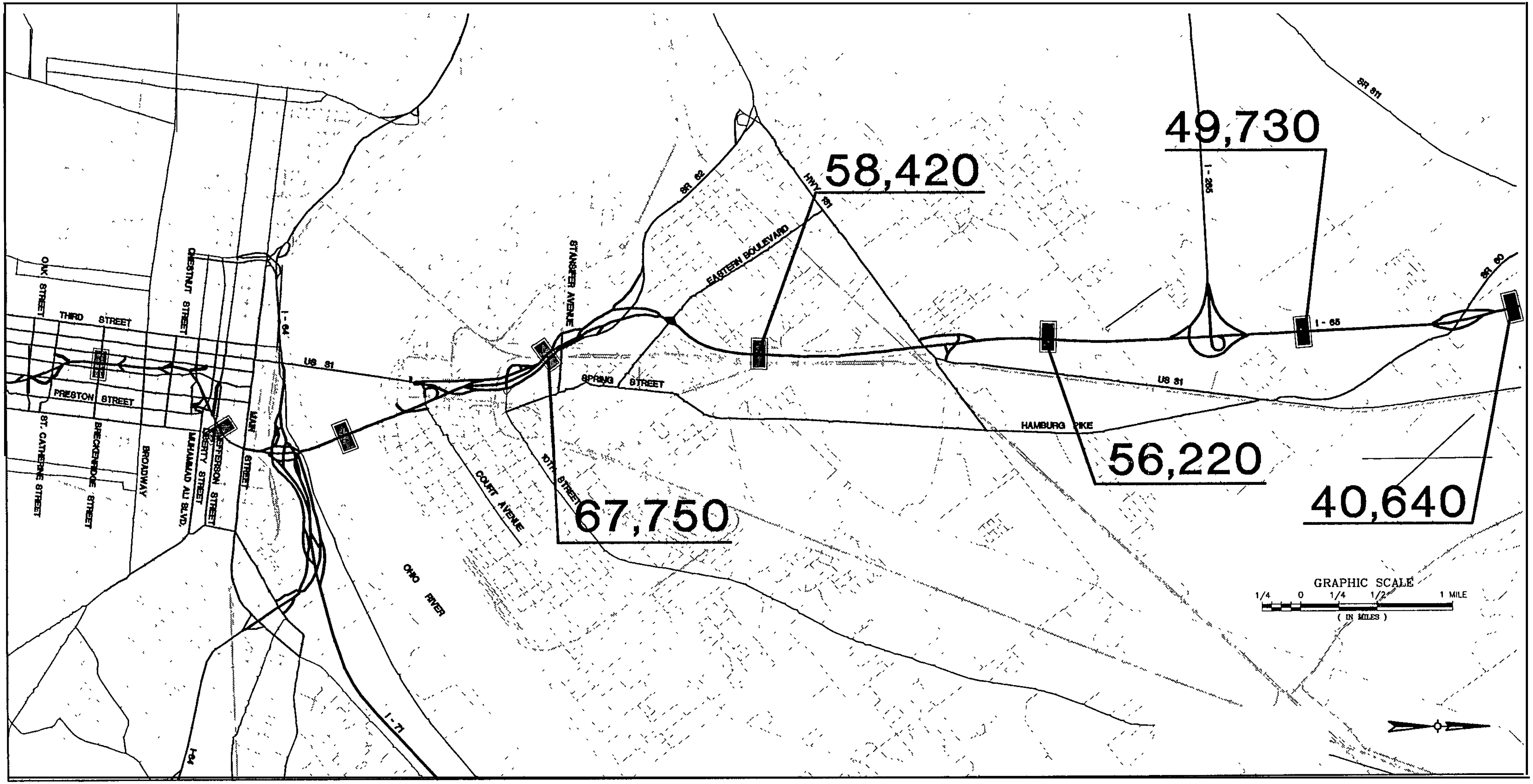
SOURCE:
-HNTB, 1993

FIGURE 2.1a
EXISTING TRAFFIC VOLUMES
YEAR 1993



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SOURCE:
-INDOT, 1992

FIGURE 2.1b

EXISTING TRAFFIC VOLUMES
YEAR 1992

Table 2.1a Existing Traffic Volumes - Year 1993 - Kentucky

Location	ADT		AM Peak		PM Peak	
	Mainline	Ramp	Mainline	Ramp	Mainline	Ramp
I-65 Northbound - North of:						
Crittenden Drive on-ramp	60,670	4,570	5,660	450	3,920	570
Eastern Parkway off-ramp	57,350	3,320	5,440	220	3,680	240
Warnock Street off-ramp	51,100	6,250	4,865	575	3,180	500
Warnock Street on-ramp	59,110	8,010	5,350	485	3,870	690
Preston Street on-ramp	66,430	7,320	6,045	695	4,520	650
Jackson Street off-ramp	60,890	5,540	5,265	780	4,220	300
Woodbine Street off-ramp	59,990	900	5,175	90	4,155	65
St. Catherine Street off-ramp	54,030	5,960	4,425	750	3,845	310
St. Catherine Street on-ramp	60,120	6,090	4,845	420	4,545	700
Broadway off-ramp	46,950	13,170	3,355	1,490	3,875	670
Brook Street off-ramp	40,390	6,560	2,305	1,050	3,520	355
Muhammad Ali Blvd off-ramp	37,340	3,050	1,780	525	3,295	225
Muhammad Ali Blvd on-ramp	54,600	17,260	2,335	555	5,525	2,230
I-65 Southbound - South of:						
Jefferson Street off-ramp	44,110	14,770	3,580	2,135	2,390	530
Liberty Street on-ramp	52,110	8,000	3,830	250	3,660	1,270
Chestnut Street on-ramp	60,130	8,020	4,170	340	4,700	1,040
Broadway on-ramp	62,230	2,100	4,245	75	4,970	270
St. Catherine Street off-ramp	55,720	6,510	3,555	690	4,445	525
Oak Street on-ramp	61,880	6,160	3,820	265	5,180	735
Magnolia Avenue on-ramp	68,860	6,980	4,200	380	6,230	1,050
Arthur Street off-ramp	58,110	10,750	3,150	1,050	5,160	1,070
Arthur Street on-ramp	61,230	3,210	3,315	165	5,530	370
Warnock Street off-ramp	54,290	7,030	2,715	600	5,065	465
Warnock Street on-ramp	60,390	3,100	2,855	140	5,600	535
Eastern Parkway on-ramp	64,390	4,000	3,005	150	5,995	395
Crittenden Drive off-ramp	58,640	5,750	2,525	480	5,610	385
Crittenden Drive on-ramp	60,720	2,080	2,640	115	5,870	260

Source: HNTB, 1993

Table 2.lb Existing Traffic Volumes - Year 1990 - Indiana

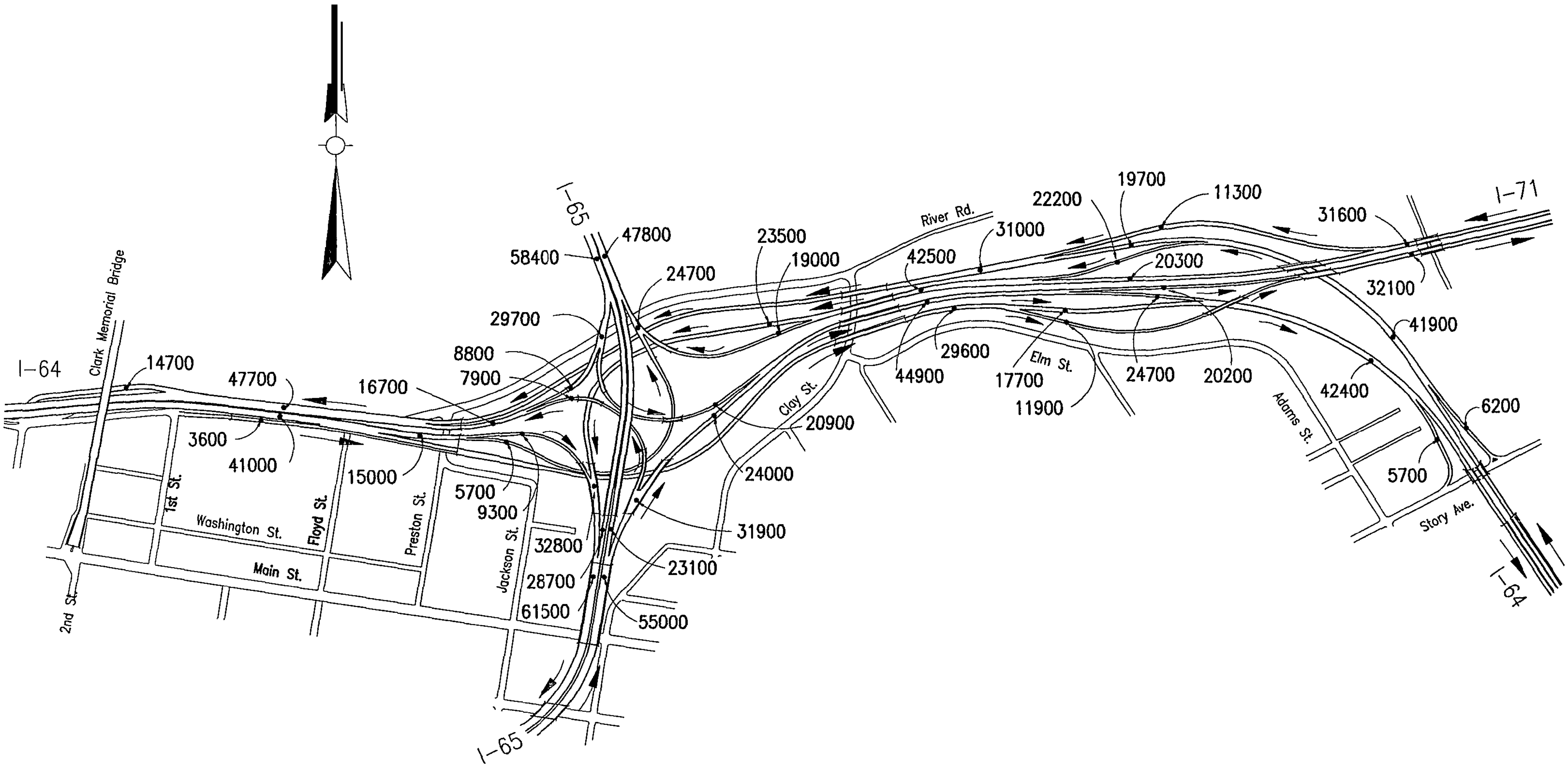
	ADT	Peak Hour	
Location	**Mainline**	**AM Peak**	**PM Peak**
I-65 Northbound:			
North of Kennedy Bridge	44,300		3,820
Court Avenue off-ramp			1,000
North of Court Avenue off-ramp	45,000		2,840
10th Street off-ramp			850
10th Street on-ramp			590
Stansifer Avenue off-ramp			280
Stansifer Avenue on-ramp			340
SR 62 off-ramp			1,150
North of SR 62 on-ramp	35,100		4,290
Eastern Boulevard off-ramp			870
North of Eastern Boulevard off-ramp			2,270
Eastern Boulevard on-ramp			155
North of Eastern Boulevard on-ramp	27,600		2,420
SR 131 off-ramp			690
North of SR 131 off-ramp			1,740
SR 131 on-ramp			650
North of SR 131 on-ramp	25,800		2,390
I-265 off-ramp			1,170
North of I-265 off-ramp			1,550
I-265 on-ramp			310
North of I-265 on-ramp	18,600		2,200
SR 60 off-ramp			1,040
North of SR 60 off-ramp			1,170
SR 60 on-ramp			235
North of SR 60 on-ramp	15,100		1,400
SR 311 off-ramp			500
North of SR 311 off-ramp			900
SR 311 on-ramp			50

Source: INDOT, 1990 (peak hour, peak direction only)

Table 2.lb Existing Traffic Volumes - 1990 - Indiana

	ADT	Peak Hour	
Location	**Mainline**	**AM Peak**	**PM Peak**
I-65 Southbound:			
SR 311 off-ramp		90	60
South of SR 311 off-ramp		1,500	
SR 311 on-ramp		480	230
South of SR 311 on-ramp	14,800	1,540	
SR 60 off-ramp		150	155
South of SR 60 off-ramp		1,380	
SR 60 on-ramp		600	320
South of SR 60 on-ramp	19,000	1,900	
I-265 off-ramp		300	
South of I-265 off-ramp		1,600	
I-265 on-ramp	10,300	800	
South of I-265 on-ramp	23,900	2,230	
SR 131 off-ramp		510	
South of SR 131 off-ramp		1,730	
SR 131 on-ramp		660	
South of SR 131 on-ramp	24,200	2,380	
Eastern Boulevard off-ramp		135	
South of Eastern Boulevard off-ramp		2,250	
Eastern Boulevard on-ramp		590	
South of Eastern Boulevard on-ramp	32,000	2,840	
SR 62 off-ramp		1,130	
Stansifer Avenue on-ramp		300	330
10th Street off-ramp		1,500	470
10th Street on-ramp		925	
Court Avenue on-ramp			720
South of Court Avenue on-ramp		3,525	3,600
Market Street off-ramp			95
South of Market Street off-ramp	40,400		

Source: INDOT, 1990 (peak hour, peak direction only)



SOURCE
-HNTB, 1993

FIGURE 2.2

EXISTING TRAFFIC VOLUMES
KENNEDY INTERCHANGE COMPLEX
YEAR 1993

A screenline analysis of existing traffic volumes on selected arterial streets was used to identify available capacity to accommodate diverted I-65 freeway traffic. (A screenline is an imaginary line across one or more roadways, created to compare total corridor volume to capacity.) Screenlines were chosen at positions where general features of the roadways change. Arterial streets with the ability to carry diverted traffic for a reasonable distance are included at five selected screenlines.

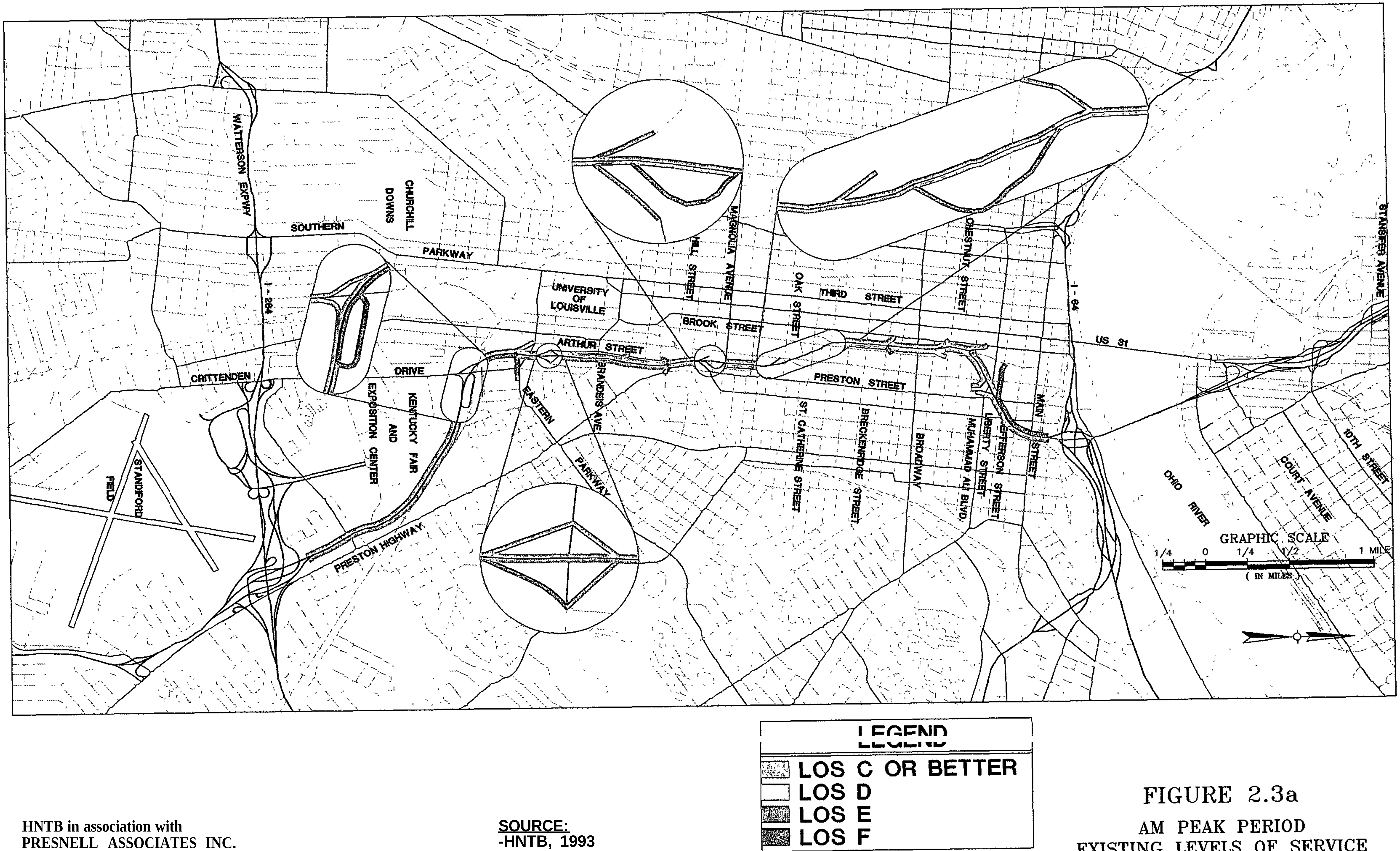
In this analysis, 24-hour volumes were compiled from KIPDA's traffic count records. In consultation with KIPDA, traffic capacities were developed, based on the number of travel lanes in each direction and the roadway type. To access the available capacity, the volume to capacity ratio was computed and assigned a level of service. The results are shown in Table 2.2.

The estimated 24-hour roadway capacities consider intersection restrictions, since conditions on local streets are heavily dependent on operations at signalized intersections. Capacity at specific locations may differ, depending on local conditions and the effectiveness of traffic signal coordination.

Table 2.2
24-Hour Local Street Screenline Analysis

No	North-South Location	Cross Street	Volume (ADT)	Lanes	Capacity	V/C Ratio max=1.0	Level of Service	Excess Capacity
1	North of Market Street	3rd Street	16,775	3 SB	24,400	0.69	C	7,625
		2nd Street	18,150	3 NB	24,400	0.74	C	6,250
		1st Street	5,975	2 SB	16,300	0.37	A	10,325
		Brook Street	7,000	3 NB	24,400	0.29	A	17,400
		Floyd Street	3,700	2	16,300	0.23	A	12,600
		Preston Street	4,325	2 SB	16,300	0.27	A	11,975
		Jackson Street	550	2 NB	16,300	0.03	A	15,750
		TOTAL	**56,475**		**138,400**			**81,925**
2	North of Chestnut Street	3rd Street	20,625	3 SB	24,400	0.85	D	3,775
		2nd Street	23,725	3 NB	24,400	0.97	E	675
		1st Street	19,975	3 SB	24,400	0.82	D	4,425
		Brook Street	23,325	4 NB	32,500	0.72	C	9,175
		Floyd Street	11,050	2	16,300	0.68	C	5,250
		Preston Street	10,625	2 SB	16,300	0.65	C	5,675
		Jackson Street	11,575	2	16,300	0.71	C	4,725
		TOTAL	**120,900**		**138,300**			**33,700**
3	North of Breckenridge St.	3rd Street	14,425	2 SB	16,300	0.88	D	1,875
		2nd Street	9,125	2 NB	16,300	0.56	B	7,175
		1st Street	12,350	2 SB	16,300	0.76	D	3,950
		Brook Street	4,425	2 NB	16,300	0.27	A	11,875
		Floyd Street	5,400	2	16,300	0.33	A	10,900
		Preston Street	6,900	2 SB	16,300	0.42	A	9,400
		Jackson Street	6,375	2 NB	16,300	0.39	A	9,925
		TOTAL	**59,000**		**114,100**			**55,100**
4	North of Hill Street	3rd Street	11,950	2 SB	16,300	0.73	C	4,350
		2nd Street	11,600	3 NB	24,400	0.48	A	12,800
		1st Street	5,700	2 SB	16,300	0.35	A	10,600
		Brook Street	4,650	2 NB	16,300	0.29	A	11,650
		TOTAL	**33,900**		**73,300**			**39,400**
5	North of Brandeis Ave.	3rd Street	11,250	2 SB	16,300	0.69	C	5,050
		2nd Street	11,000	2 NB	16,300	0.67	C	5,300
		Preston Hwy	11,100	2	16,300	0.68	C	5,200
		TOTAL	**33,350**		**48,900**			**15,550**

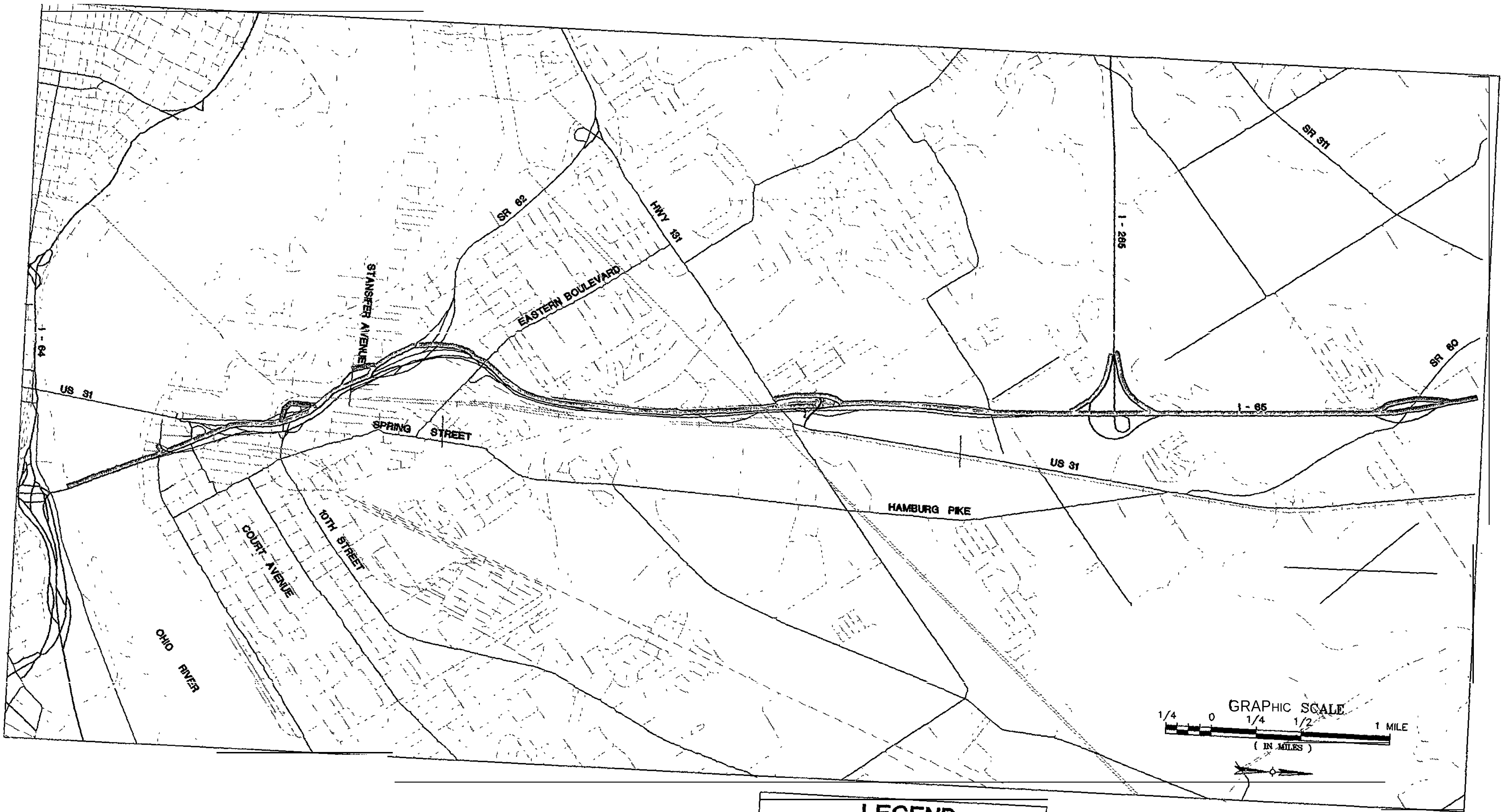
Source: KIPDA, HNTB, 1993



HNTB in association with
PRESNELL ASSOCIATES INC.
I-65 Freeway Incident Management Study

SOURCE:
-HNTB, 1993

FIGURE 2.3a
AM PEAK PERIOD
EXISTING LEVELS OF SERVICE



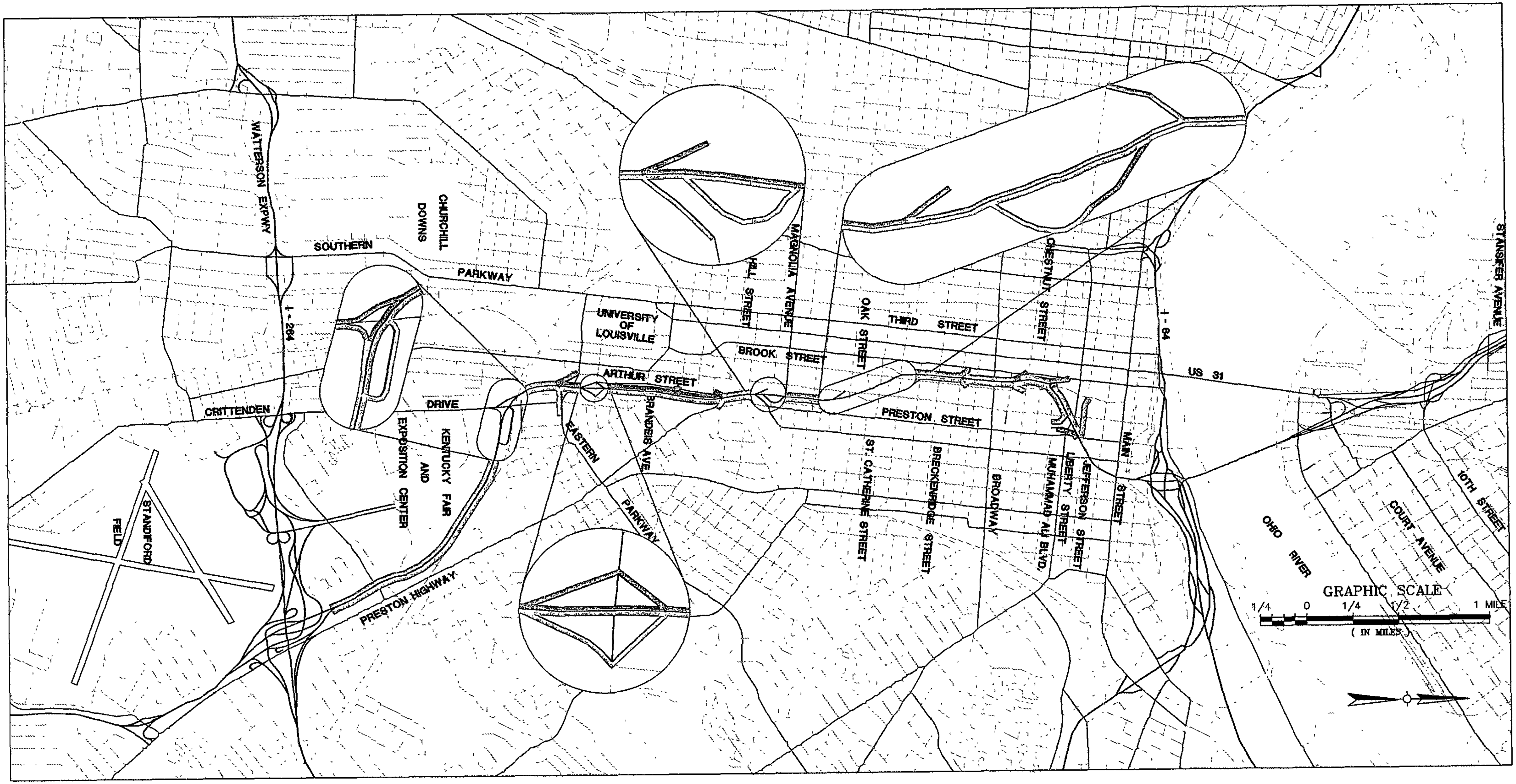
HNTB in association with
PRESNELL ASSOCIATES INC
I-65 Freeway Incident Management Study

SOURCE,
-INDOT I-65 STUDY, OHIO RIVER TO S.R. 311, 1991.

LEGEND
LOS C OR BETTER
LOS D
LOS E
LOS F

FIGURE 2.3b

AM PEAK PERIOD
EXISTING LEVELS OF SERVICE



LEGEND

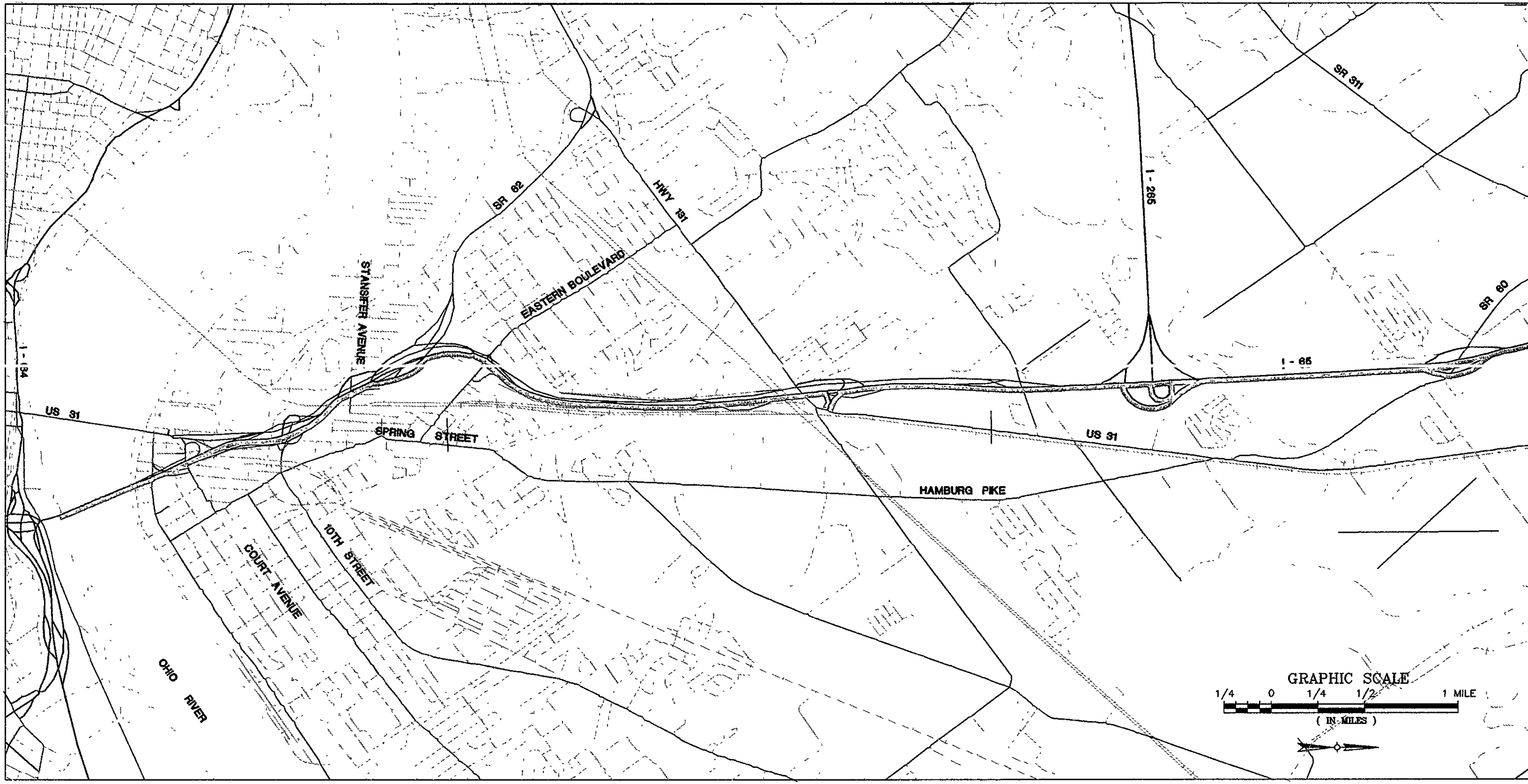
- LOS C OR BETTER
- LOS D
- LOS E
- LOS F

FIGURE 2.4a

PM PEAK PERIOD
EXISTING LEVELS OF SERVICE

SOURCE:
-HNTB. 1993

HNTB in association with
PRESNELL ASSOCIATES INC.
I-65 Freeway Incident Management Study



LEGEND
BETTER C OR LOS D
LOS E
LOS F

HNTB in association with
PRESNELL ASSOCIATES INC.
I-65 Freeway Incident Management Study

SOURCES
-INDOT I-65 STUDY, OHIO RIVER TO S.R. 311, 1991.

FIGURE 2.4b

PM PEAK PERIOD
EXISTING LEVELS OF SERVICE

2.4 Forecasted Traffic Volumes

Forecasted volumes for I-65 were obtained from KIPDA's areawide MINUTP travel demand model. Average daily traffic forecasts for the three Year 2010 Ohio River bridge scenarios were reviewed, with each yielding similar results for the section of I-65 between Crittenden Drive and Muhammad Ali Boulevard. Between the Kennedy Interchange and I-265, I-65 volumes for the downtown bridge and I-265 bridge scenarios were similar; I-65 volumes for the I-264 bridge scenario were approximately 25 percent less. Based on the information provided by KIPDA, Figures 2.5a and 2.5b present representative daily traffic forecasts for the Year 2010.

Traffic forecasts indicate that volumes are likely to increase 20 to 40 percent during the next 15 years. All sections in Kentucky are predicted to exceed 130,000 vehicles per day, with volumes as high as 175,000 vehicles per day near the University of Louisville. This magnitude of traffic would exceed available capacity during peak periods.

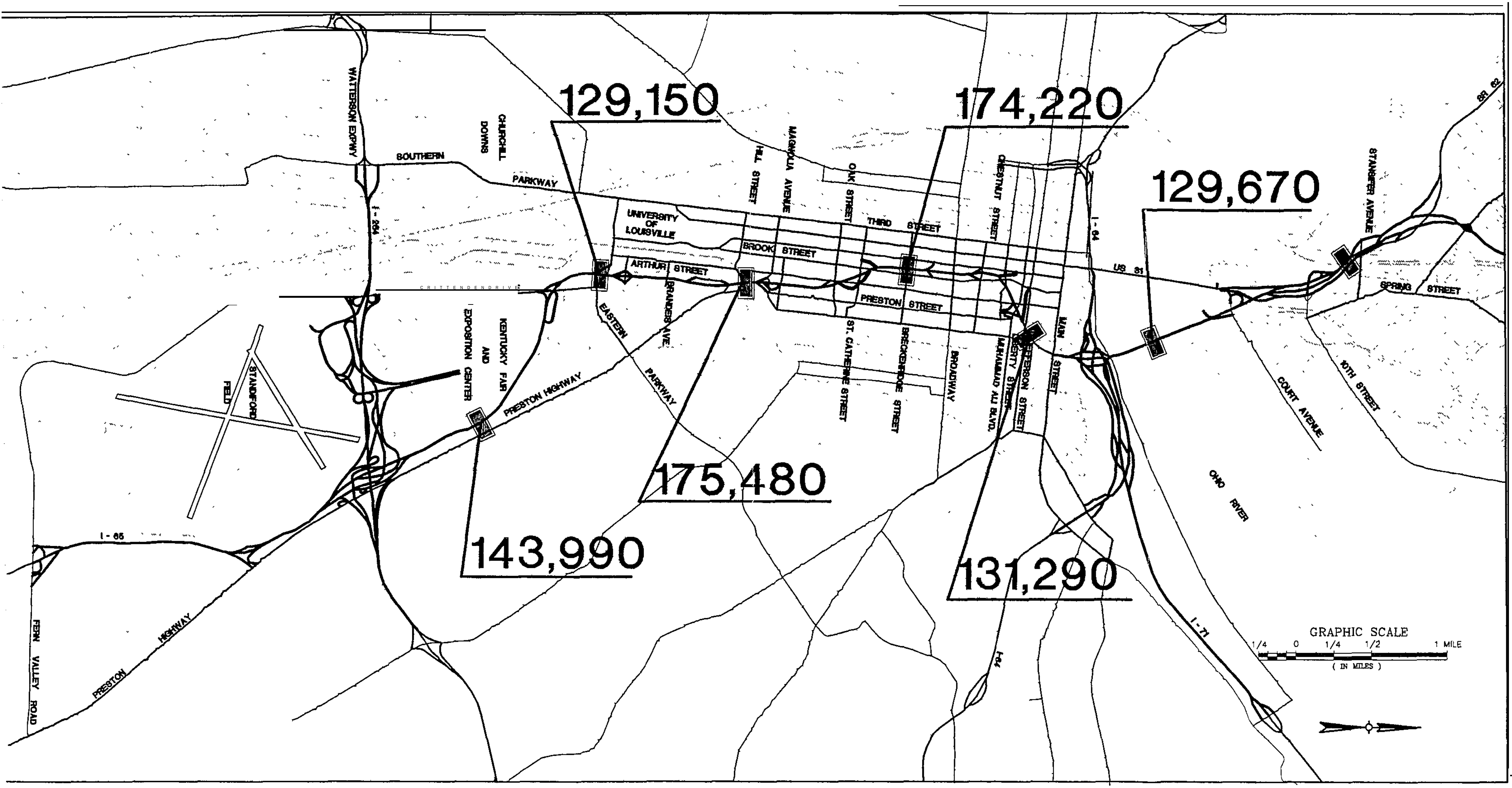


FIGURE 2.5a

PROJECTED TRAFFIC VOLUMES
YEAR 2010

HNTB in association with
RESNELL ASSOCIATES INC.
-65 Freeway Incident Management Study

SOURCE:
-KIPDA, 1993

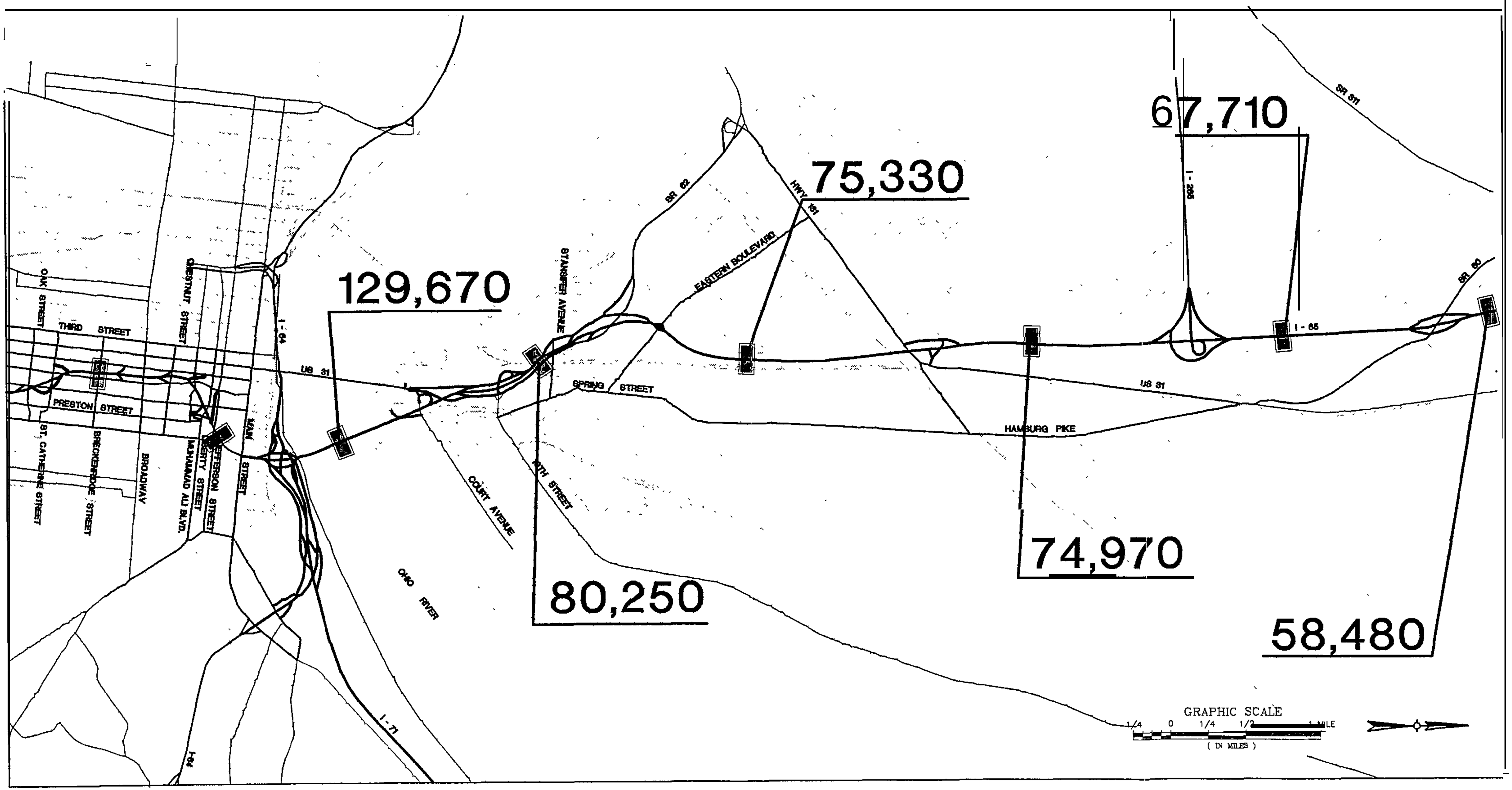


FIGURE 2.5b

PROJECTED TRAFFIC VOLUMES
YEAR 2010

SOURCE:
-KIPDA, 1993

HNTB in association with
PRESNELL ASSOCIATES INC.
I-65 Freeway Incident Management Study

2.5 Accident and Incident Data

In Kentucky, 1993 accident data was provided by the Louisville Division of Police. In addition, they also provided 1992 and 1993 incident response data. In Indiana, 1993 accident data was provided by INDOT. No ready source was identified for general incident data in Indiana. Figures 2.6a and 2.6b show total reported accidents by major freeway section. Comparing these figures with the existin, traffic volumes shown in Figures 2. la and 2. lb illustrates the direct relationship between accident frequency and traffic volumes.

Accident data records and reporting methods vary between each state. Observations presented below reflect the nature of available information.

Kentucky

In addition to the accident data provided by the Louisville Division of Police, KyTC provided a summary of accident information on the Jefferson County freeway system for the years 1989-1991. KyTC's statistics list I-65 north of the Watterson Expressway within the "higher than expected" category for urban freeway accidents.

Based on a sample of the incident data provided by Louisville Division of Police, approximately 18 percent of the total incidents (including accidents) occurred during the AM peak period from 7:00 AM to 9:00 AM, 17 percent in the PM peak period from 4:00 PM to 6:00 PM, 40 percent occurred between the hours of 9:00 AM and 4:00 PM, and 25 percent of the total incidents on an average day occurred between 6:00 PM and 7:00 AM. Approximately 86 percent of the total incidents occurred on a weekday (Monday through Friday).

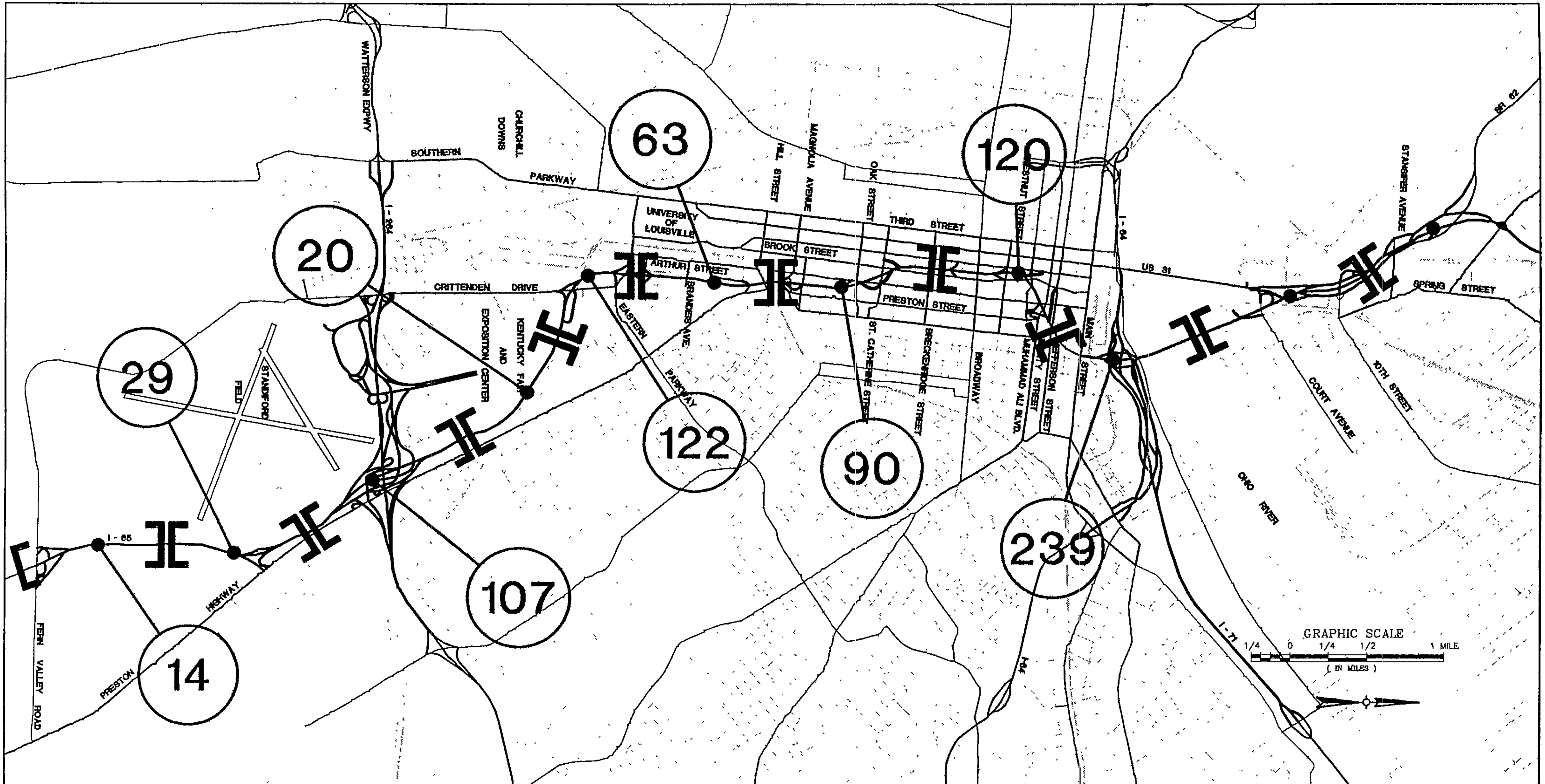
From the incident data, the average duration required for the officer to clear the travel lanes was determined. This value should not be confused with the incident clearance time, which concludes when all responders have left the scene. The average time was 16 minutes during the AM peak hour, 21 minutes during the PM peak hour, and 24 minutes during the midday. The average during the hours of 6:00 PM to 7:00 AM was estimated at 19 minutes.

Indiana

For the nine-mile segment in the study area, 86 percent of the accidents (246 of 285) occurred on the mainline, and 14 percent of the accidents (39 of 285) occurred on the ramps. Approximately 21 percent of the total accidents occurred during the PM peak period (3:00 p.m.-6:00 p.m.) and 13 percent occurred during the AM peak period (6:00 a.m. - 9:00 a.m.).

A total of 39 accidents occurred on interchange ramps, with 49 percent of the total (19 accidents) occurring at the US 31/SR 131 Interchange. Fourteen of these 19 accidents involved two vehicles. The majority of the ramp accidents were non-injury accidents (77 percent), while 18 percent were one-person injury accidents, and five percent were two-person injury accidents.

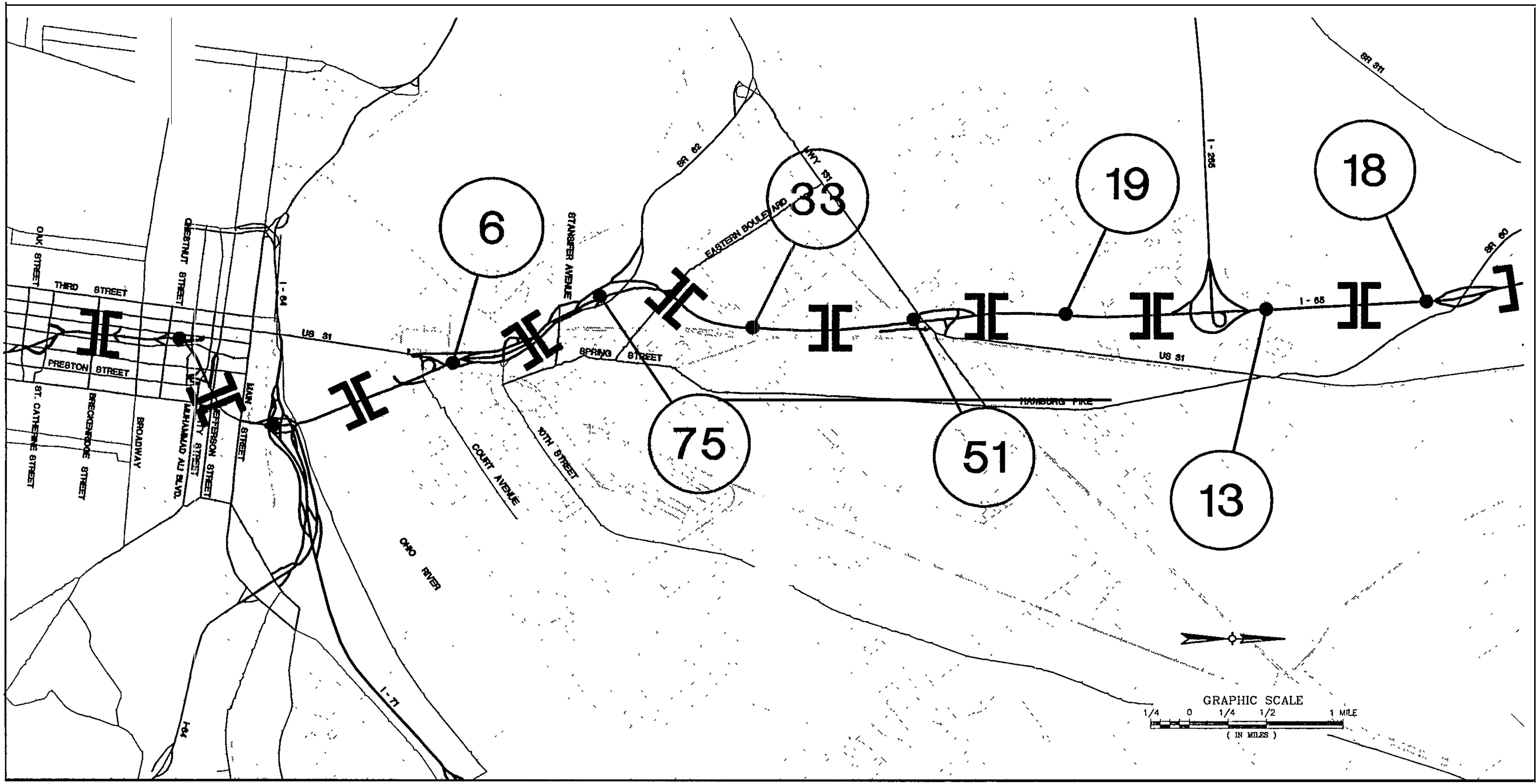
The Indiana State Police provided 1993 crash response information by location on I-65. During the 12 month period of 1993, they responded to 155 accidents within the study area.



SOURCE:
-LOUISVILLE DIVISION OF POLICE, 1993
(ACCIDENT LOCATIONS
REFERENCED AS REPORTED)

HNTB in association with
PRESNELL ASSOCIATES INC.
I-65 Freeway Incident Management Study

FIGURE 2.6a
TOTAL ACCIDENTS 1993



SOURCE:
-INDOT 1993
(ACCIDENT LOCATIONS
REFERENCED AS REPORTED)

HNTB in association with
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FIGURE 2.6b
TOTAL ACCIDENTS 1993

2.6 Diversion Routes

Potential diversion routes for I-65 are presented in two categories: regional and local. Regional diversion routes are those that give drivers with destinations outside the Metropolitan Louisville area an alternate freeway route around the incident. Local diversion routes allow drivers with destinations within the Metropolitan Louisville area an effective detour around the incident. This involves diverting traffic onto local streets upstream of the incident site, and directing them back onto the freeway using the closest downstream on-ramp.

Options for regional diversion are limited to interstate highways. Nevertheless, these routes offer the best opportunities for diversion of through traffic. As illustrated on Figure 2.7, routes available for regional diversion include I-264, I-64, I-265 (in Indiana), and I-71. For effective regional diversion, it is essential that motorists approaching the Metropolitan Louisville area be informed sufficiently in advance of their decision point to recognize and select an appropriate diversion route. In the future, I-265 in Kentucky will achieve greater importance if system coverage expands beyond the study area.

Potential local diversion routes were identified by considering blockages of individual freeway segments and then determining potential routes to bypass the restriction. These routes were evaluated on the basis of available capacity, potential constraints and conflicts, school and pedestrian zones, signing and marking changes, and traffic signal adjustments.

Potential local diversion routes in Louisville were discussed with the Traffic Engineering Division staff of the City of Louisville Public Works Department prior to initiating travel time studies. South of Eastern Parkway, possible diversion routes are limited to Preston Highway, Crittenden Drive, and Southern Parkway/Third Street. North of Eastern Parkway, different routes are possible for northbound (Second, Brook, and Jackson streets) and southbound (First and Third streets) travel. Southern Indiana also has a limited number of possible local diversion routes, due to freeway access limitations and a lack of parallel high-capacity arterial roadways. The most suitable routes for diversion are US 31, SR 131, and SR 62.

The City of Louisville's existing signal network is divided into three generalized control areas: signals on Broadway, signals north of Broadway, and signals south of Broadway. The City has retained a consultant to study, design, and implement a city-wide traffic signal control system. As currently planned, the new signal system will be implemented by the year 1997.

Average travel speeds were calculated based on the travel time data. Most traffic on the survey routes operated at or close to the posted speed limit. The most significant delays occurred due to lack of signal coordination crossing Broadway. Delays were also experienced near schools and at bus stops. These delays were most prevalent during morning peak periods.

Potential problem sections along the local diversion routes include areas with physical obstructions, residential areas, school zones, hospitals, pedestrian crossings and bus stops. Any incident occurring on I-65 between Broadway and Eastern Parkway would require diverting traffic through residential neighborhoods. Schools are located along many parallel diversion routes, including Jackson, Brook, First, and Second streets.

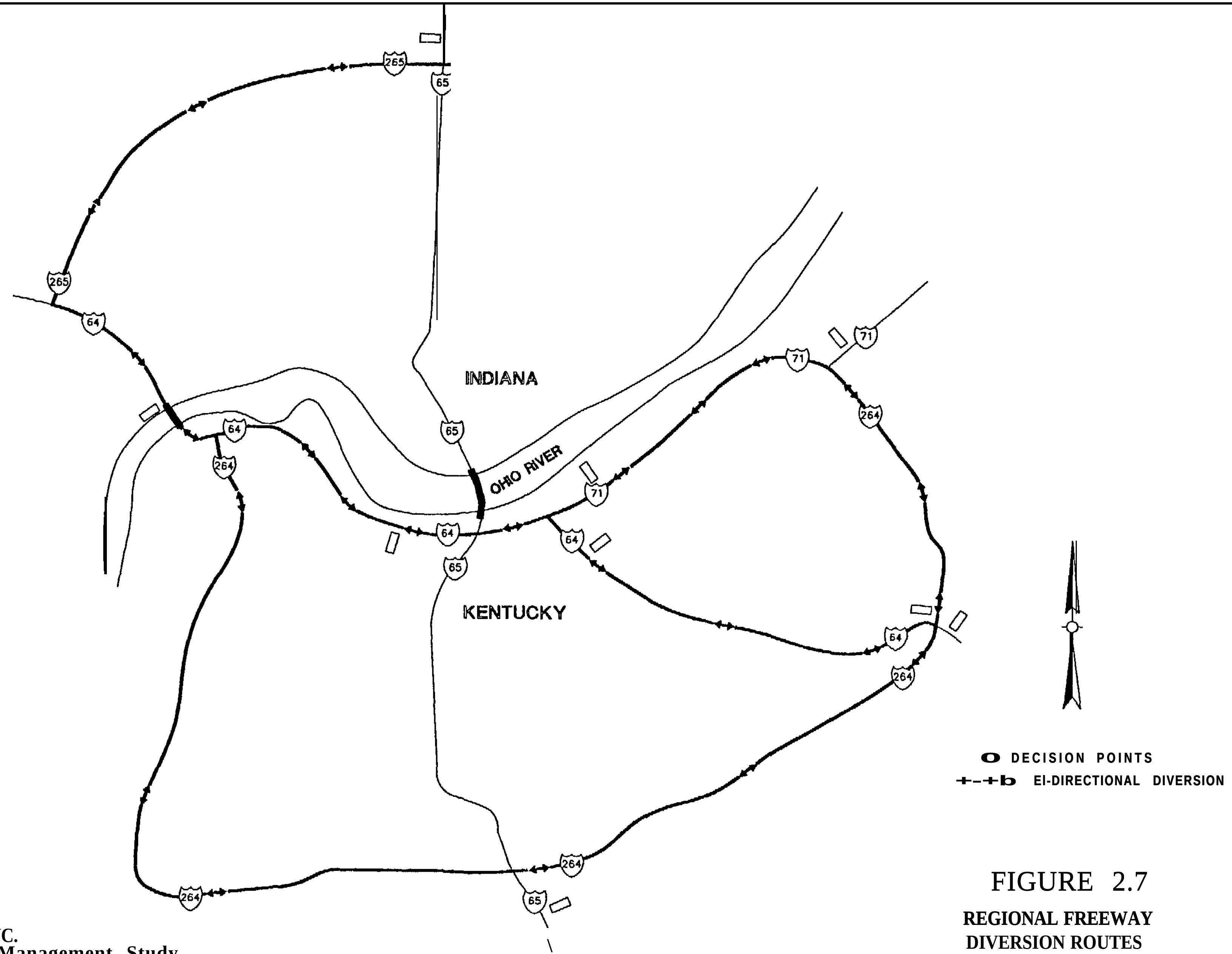

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FIGURE 2.7

REGIONAL FREEWAY DIVERSION ROUTES

The area north of Broadway and east of I-65 is a medical complex with five hospitals. Increased traffic on Brook Street and Jackson Street could have an adverse effect on vehicles trying to reach any of the hospitals. A pedestrian crossing is located at the University of Louisville Hospital on Jackson Street, just north of Chestnut Street.

Bus loading areas are located along most of the routes but presented the greatest delay near the on-ramps on Muhammad Ali Boulevard west of Jackson Street and at Liberty Street east of Brook Street.

Attention must also be given to the movement of commercial vehicles on the local streets. Restrictions such as low overhead clearances, structures with low weight tolerances, and tight turning radii can present serious mobility problems. No areas were identified on the routes that would restrict the flow of heavy vehicles.

Considering the factors referred to above, arterial routes have been identified for local diversion and are shown on Figures 2.8a, 2.8b, 2.8c, and 2.8d. Also shown are the previously mentioned trouble spots and locations of response personnel, including the police stations, fire stations, and EMS dispatch centers. Benefits and limitations of the primary recommended diversion routes are briefly summarized following the figures.

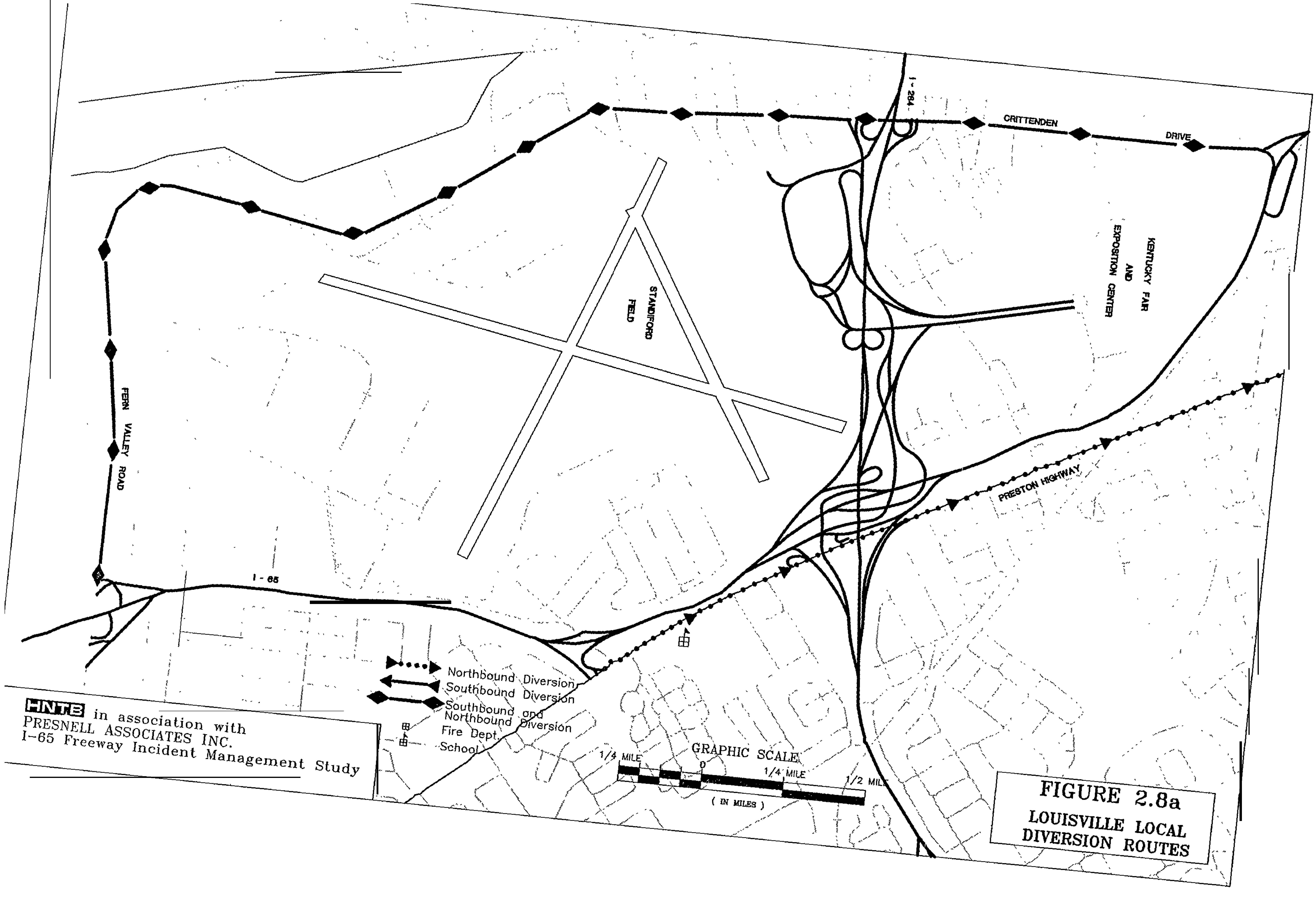


FIGURE 2.8a
LOUISVILLE LOCAL DIVERSION ROUTES

HNTB in association with
PRESNELL ASSOCIATES INC.
I-65 Freeway Incident Management Study

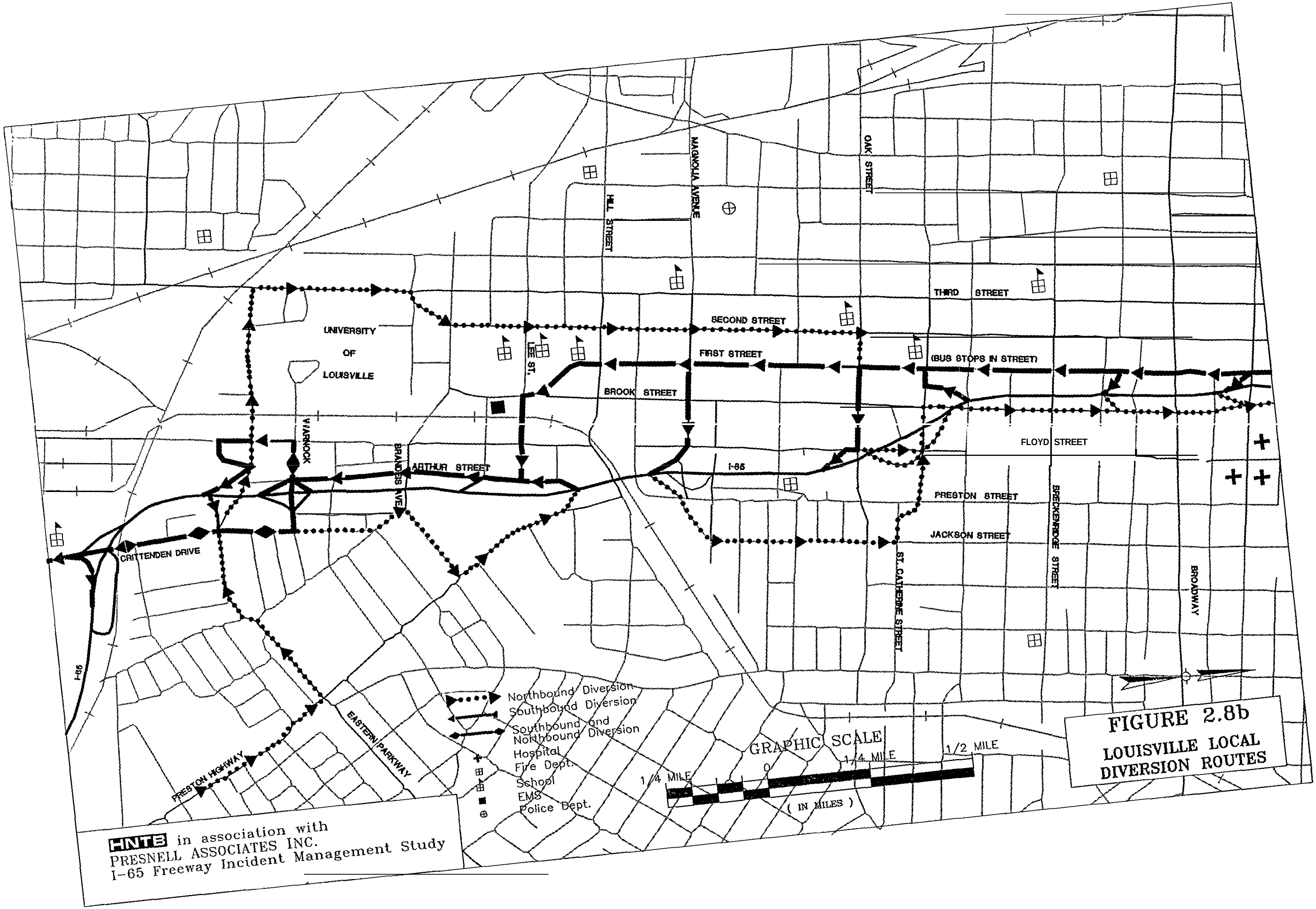


FIGURE 2.8b
LOUISVILLE LOCAL DIVERSION ROUTES

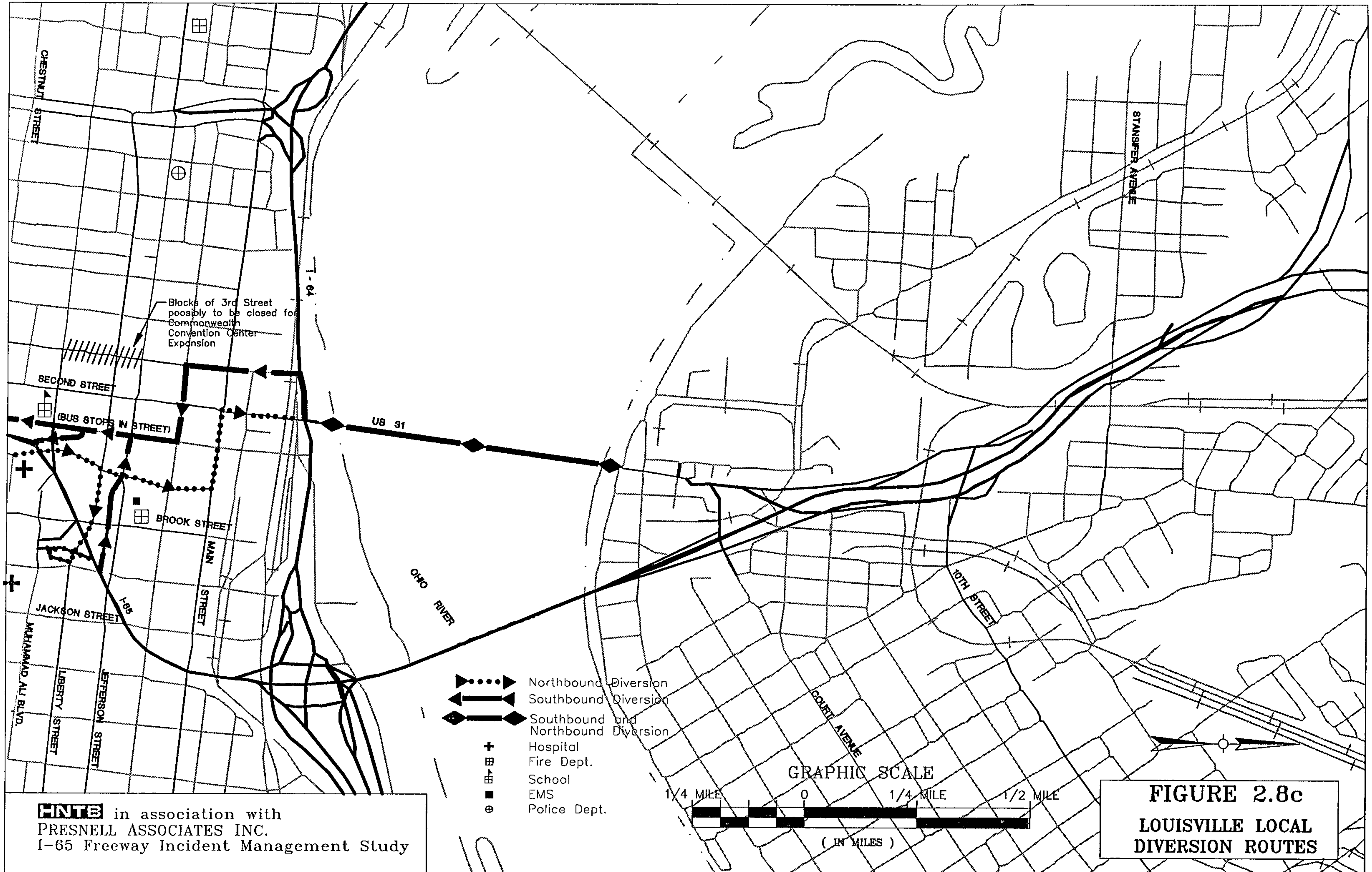
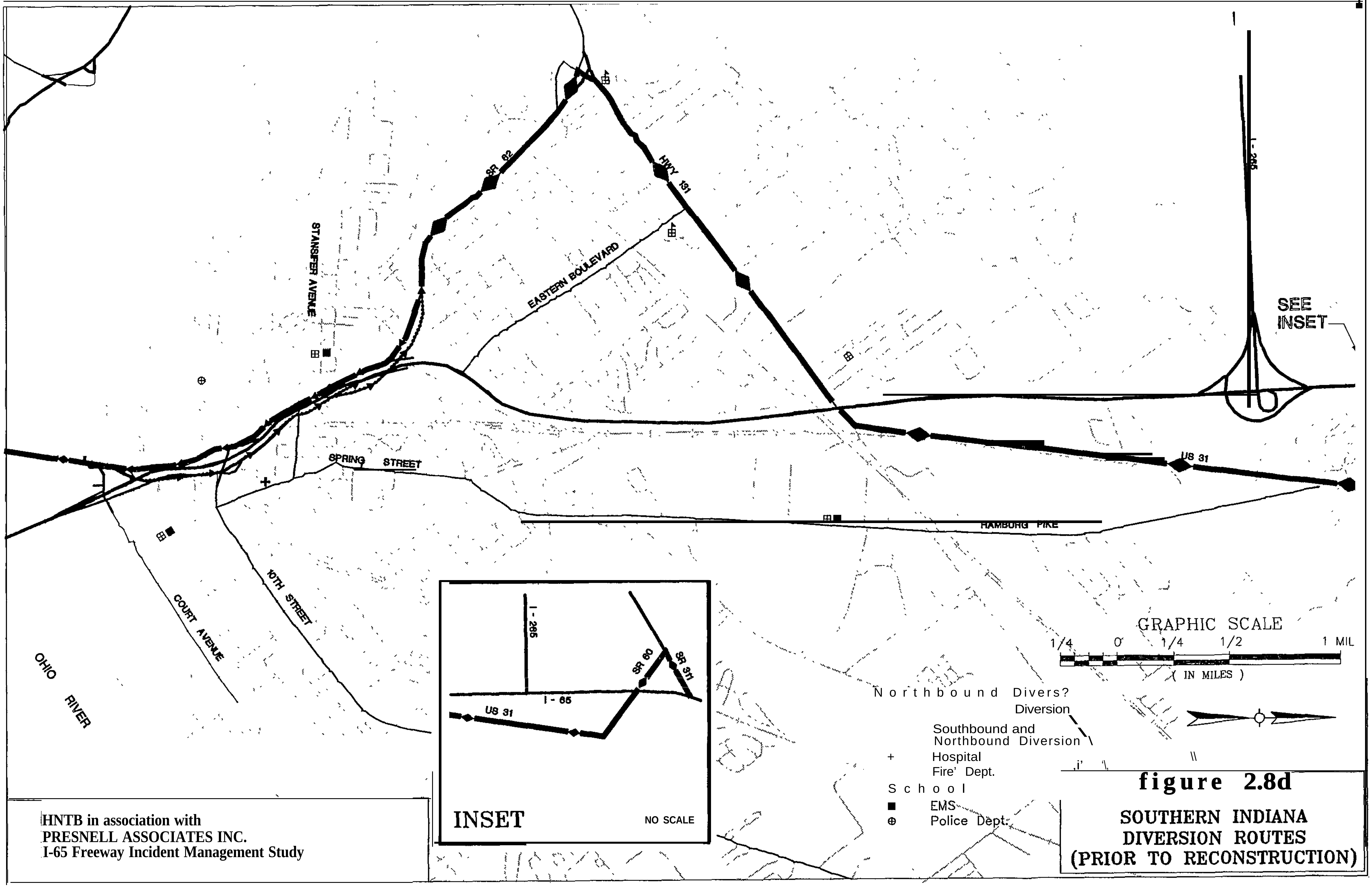


FIGURE 2.8c

LOUISVILLE LOCAL DIVERSION ROUTES

HNTB in association with
PRESNELL ASSOCIATES INC.
I-65 Freeway Incident Management Study



HNTB in association with
PRESNELL ASSOCIATES INC.
I-65 Freeway Incident Management Study

figure 2.8d

SOUTHERN INDIANA DIVERSION ROUTES (PRIOR TO RECONSTRUCTION)

Preston Highway - Northbound Kentucky Diversion Route

Benefits

- Good interstate signing along route
- Traffic signals are coordinated
- Excess capacity available
- Commercial area
- Few residential areas located along route
- Good access for commercial vehicles
- No hospitals located along route

Limitations

- One low overhead clearance located along route
- One school located along route
- TARC bus stops located along route
- Pedestrian crossings (at intersections) located along route
- Access problems could occur when events are being held at the Kentucky Fair and Exposition Center

Crittenden Drive - Northbound and Southbound Kentucky Diversion Route

Benefits

- Good interstate signing along route
- Excess capacity available
- Commercial area
- Good access for commercial vehicles
- No hospitals located along route
- No pedestrian crossings located along route

Limitations

- Traffic signals are not coordinated
- One school located along route
- Access problems could occur when events are being held at the Kentucky Fair and Exposition Center
- Future extension of Central Avenue may cause additional congestion
- Scheduled to be closed south of I-264 for airport expansion

First Street - Southbound Kentucky Diversion Route

Benefits

- Good interstate signing along route
- Traffic signals are coordinated
- Greater excess capacity available than for Third Street
- No hospitals located along route

Limitations

- Three schools located along route
- TARC bus stops located along route
- Residential areas located along route
- Pedestrian crossings (at intersections) located along route

Jackson Street - Northbound Kentucky Diversion Route

Benefits

- Good interstate signing along route
- Traffic signals are coordinated
- Greater excess capacity available than for Brook Street or Second Street
- Good access for commercial vehicles
- Unsignalized ramp intersection with I-65

Limitations

- Poor surface street signing
- One school located along route
- TARC bus stops located along route
- Residential areas located along route
- Pedestrian crossings (at intersections) located along route

US 31 - Northbound & Southbound Indiana Diversion Route

Benefits

- Traffic signals are coordinated
- Excess capacity available
- Good access for commercial vehicles
- No schools located along route
- No hospitals located along route
- No pedestrian crossings located along route
- Commercial area

Limitations

- Poor ramp geometries at I-65
- Poor sight distance at SR 60

SR 131 - Northbound & Southbound Indiana Diversion Route

Benefits

- Good interstate signing along route
- No schools located along route
- No residential areas located along route
- No hospitals located along route
- No pedestrian crossings located along route
- Commercial area

Limitations

- Poor traffic signal progression
- Poor ramp geometries
- Congested highways

SR 62 - Northbound & Southbound Indiana Diversion Route

Benefits	Limitations
- Good interstate signing along route - More excess capacity available than for Eastern Boulevard - No schools located along route • No hospitals located along route • No bus stop located along route - No pedestrian crossings located along route - Good access for commercial vehicles	• Poor access to/from SR 131 (90° turn)

Effective motorist information systems and preplanning for specific incident locations will be keys to effective diversion for major incidents on I-65. Motorist information systems will be particularly important for regional diversion since through travelers must make necessary route decisions well in advance of incident locations. Preplanning for local diversion will allow routing, traffic control, and motorist information activities to be quickly implemented for incidents at any location on the freeway. Close coordination with transportation agencies and utilities is necessary to ensure that diversion route selection accounts for construction activities (this structure is already in place with the City of Louisville). These elements will be refined as a part of final design for the system.

2.7 Special Facilities

Three facilities located along or close to the I-65 corridor were identified as "special facilities" for the purpose of this study. These are the Kentucky Fair and Exposition Center, Standiford Field, and Churchill Downs. These facilities warrant specific consideration in planning the incident management system due to their unique character and high traffic demands. Interviews were held with representatives of each of these facilities. The results of these interviews are summarized below.

Kentucky Fair and Exposition Center

The Kentucky Fair and Exposition Center is the site of a wide range of events held throughout the year. Traffic generated by the facility differs on a daily basis, depending on the magnitude and type of events being held. It is common for simultaneous events to be underway with varying timetables and attendance. As a result, traffic generated by the facility varies.

Access to the Kentucky Fair and Exposition Center is currently provided at four gates. The most utilized entry is Gate 1, also known as the Main Gate. Access is provided directly from the Watterson Expressway on a four-lane arterial roadway leading to the main parking area. Other gates are provided on Preston Street and Crittenden Drive. These arterials provide alternate routes for accessing gates from I-65 and the Watterson Expressway.

Historically, traffic volumes served by the existing gates have been imbalanced. In spite of efforts by the Fair and Exposition Center to publicize other access routes, the public continues to favor the main gate, even if it is congested. This may change with the extension and reconstruction of the Ring Road in 1994.

As currently planned, the new Ring Road will provide counter-clockwise one-way movement around the full perimeter of the Kentucky Fair and Exposition Center. In addition to improving traffic flow, this should distribute traffic more effectively to and from existing parking areas and gates. New signing will be installed with the project to better inform motorists of available options.

In order for the Ring Road to be most effective in its intended purpose of dispersing and distributing traffic, motorists must be informed of congestion and alternate routes as they approach or leave the Fair and Exposition Center. This would best be accomplished by coordinating internal and external motorist information systems, such as variable message signs and highway advisory radio.

Traffic management functions inside and outside the Fair and Exposition Center site are also closely related. Information sharing regarding major events and roadway system characteristics should occur routinely. In particular, local police and emergency response personnel can perform their jobs more effectively if they know the magnitude and timing of impending high demands.

The existing freeway system is well suited to accommodate traffic volumes generated by events at the facility. Improvements could be made, however, on arterial roadways which provide access to the freeways. (Only the Main Gate provides direct access to and from an interstate highway.) In particular, priority signal control for Fair and Exposition Center patrons would be beneficial on Preston Street. These signal improvements would cause minimal commuter flow disruption since special event and peak-hour traffic flows rarely coincide.

Standiford Field

Standiford Field plays an essential role in meeting the multimodal travel needs of the Metropolitan Louisville area. Access is provided by way of the Watterson Expressway near its junction with I-65. Service at the entry interchange is good as a result of recent freeway reconstruction in the area.

Peak traffic flows at airports ordinarily result from hubbing operations of aircraft. As aircraft converge at specified times to allow ease of transfers, local traffic is also more concentrated. Since Standiford Field does not currently serve as a hub for any airline, arrivals and departures are not grouped at any particular time. As a result, traffic demand is spread relatively evenly throughout the day, with no significant peaking characteristics.

Additional traffic peaks relate to shift change times for air freight operations at Standiford Field, particularly for United Parcel Service. Since most freight is loaded or unloaded during the night, these commuter traffic movements occur at non-peak time with respect to the traffic network. Nevertheless, these jobs tend to be very time sensitive, making it especially important to maintain good access during all periods.

A primary benefit of Standiford Field is good access due to its proximity to freeways and its location only six miles from downtown. These benefits are compromised, however, during times of heavy congestion or incidents. Delays for airport-bound motorists can be particularly disruptive, especially for motorists who are unfamiliar with the area. Effective incident management and motorist information systems are designed to minimize this disruption.

It is conceivable that aviation related incidents, such as an off-airport emergency landing, could directly impact freeway operations. If such an event occurred, it would probably affect multiple lanes of traffic and might require rapid response by emergency response personnel. Effective preplanning, agency coordination, and motorist information would be particularly beneficial in minimizing the impact of an aviation incident. Should I-264 be closed, diversion routes would include Crittenden Drive, Eastern Parkway, and Preston Highway.

The most significant physical feature of the Standiford Field access system is the reliance on a single interchange and entrance roadway. Due to the importance of the airport and its continuing need for access, prompt response to incidents on the entrance roadway is essential.

<u>Churchill Downs</u>

Churchill Downs is nationally known for hosting the Kentucky Derby. This event, held annually on the first Saturday in May, has an attendance of more than 125,000 people. Due to the high volume of traffic generated by the Kentucky Derby, special traffic control plans are implemented each time the event is held. These plans involve a wide range of law enforcement and incident response personnel, who review and refine these plans each year.

The second largest event held at Churchill Downs is the Oaks Day, held the Friday before the Kentucky Derby. This event is attended by 80,000 to 100,000 people each year. As with the Kentucky Derby, traffic control for this event is addressed in a coordinated plan which is reviewed and refined on an annual basis.

Other events at Churchill Downs are accommodated without special traffic control plans, since average attendance is approximately 15,000 patrons per event.

Unlike Standiford Field and the Kentucky Fair and Exposition Center, Churchill Downs is not directly served by a freeway. The facility is served, however, by arterial roadways which access interstate highways at four locations.

2.8 Summary of Existing and Future Conditions

This section presents descriptive data and information related to the section of I-65 being reviewed in this study. A review of this information identifies various system characteristics which relate to selection of an appropriate approach to developing and operating an incident management system. Some of the more pertinent observations are briefly listed below:

- Geometric conditions are a contributing factor to incidents in both Indiana and Kentucky. Existing grades, merging/weaving lengths, shoulder widths, and spacing between ramps are less than desirable, reflecting the design parameters in use at the time these facilities were constructed. INDOT has programmed major improvements to correct many of these deficiencies. This option appears unlikely at this time for KyTC due to high cost and intensity of adjacent urban development.

- Overall traffic volumes are consistently higher on the sections of I-65 located within the City of Louisville, and many sections experience significant congestion during peak periods. Traffic forecasts provided by KIPDA suggest that this condition will become more severe in the future. Improvement plans for I-65 in Indiana will reduce future congestion, but maintaining traffic during construction will be a major concern.

- Travel time and delay studies on potential diversion routes suggest that existing signalized intersections will be the greatest source of delay if traffic is diverted from the freeway due to an incident. This highlights the importance of coordinated responses by transportation and incident response agencies.

- Existing data shows that frequency of accidents on I-65 is higher in Louisville than in Indiana. This finding is consistent with expectations, given the higher traffic volumes and reduced geometric conditions on this section of I-65. These same factors suggest that conditions will become worse as volumes increase in the future.

- The Kentucky Fair and Exposition Center, Standiford Field, and Churchill Downs rely heavily on the freeway system to provide access to and egress from their facilities. Each of these facilities would benefit directly from improved traffic flow within the study area.

Each of the above observations about roadway and traffic characteristics is significant with respect to incident management in the Metropolitan Louisville area. Equally important in developing appropriate system recommendations is the incident response system of the area. This is reviewed in the next section.

3. INCIDENT RESPONSE

Source: The Courier-Journal

December 1, 1993

Flatbed truck carrying junk cars flips over on I-71 North causing traffic delays for three hours south of Ohio Street.

3. INCIDENT RESPONSE

This section identifies existing incident response agencies, emergency response procedures, constraints to effective incident management, and suggestions (by incident response personnel) for improved response.

3.1 Participating Agencies

Primary and secondary responders to incidents in the project area were identified, and questionnaires were prepared to solicit their views on existing problems, potential solutions and procedures to implement freeway incident management strategies. The questionnaires also requested information regarding service areas, responsibilities, procedures, response time, and resources. Distribution was made during September 1993. Most questionnaires were completed and returned during October 1993.

Questionnaires were distributed to the agencies listed below. In addition, interviews were conducted with the Louisville Division of Police and the Indiana State Police.

KENTUCKY

Louisville Division of Police
Louisville Fire Department
Louisville EMS
Louisville & Jefferson County Disaster & Emergency Services
Hazardous Material Response Team
WHAS Radio Helicopter Traffic Tracker
Kentucky Department of Highways
Jefferson County Fire Chief's Association

INDIANA

Indiana State Police
Clarksville Police Department
Jeffersonville Police Department
Clark County Sheriff Department
Jeffersonville Fire Department
Sellersburg Fire Department
Clarksville Street Department
Clark County Emergency Management Agency
Jeffersonville Engineering Department
Clark County Operation Life (EMS)
INDOT Maintenance Division

3.2 **Summary of Responses**

The purpose of incident response questionnaires and interviews was to identify issues and solicit suggestions. The process was not intended to provide statistically valid results or direct comparison between responders (such as comparing "response times").

The results of the incident response questionnaire and interview process are summarized in tabular and narrative form. Tables 3. la and 3. lb present questionnaire answers that lend themselves to numerical tabulation. Narrative responses are listed in Table 3.2.

Table 3.1a
Incident Response Matrix - Kentucky

QUESTIONS	Louisville Div. of Police	Louisville EMS	Louisville Fire Department	Louisville Fire Dept. (Haz. Mat.)	Louisville/ Jeff. Co. DES	Okolona Fire Dept.	KyTC
1. Does your agency respond to incidents on I-651	Yes	Yes	Yes	Yes	Yes	Yes	Yes
2. If yes, approximately how many incidents does your agency respond to each month?	20+	20+	6-10	6-10	0-5	0-5	6-10
3. what types of incidents does your agency respond to?	All	I, HM, M	F, HM, R	F, HM, R	HM, I	F, HM	H, D
4. What types of incidents does you agency NOT respond to?	H	B, D, S, F, H	B,I	None	All except HM, I	?	F
5. To whom is your agency responsible7 To whom does it report?	Lou.	Lou.	Lou.	Lou.	Lou./Jeff. Co.	Fire Dept.	KyDOT
6. What type of records are. kept regarding incident response?	Detail Comp.	Detail Comp.	Detail Comp.	Detail Comp.	Report	KY FIRS	Pyrl/eqpt.
7. What is the average response time to an incident on I-65? a. Occurrence lo notification b. Notification to dispatch c. En route average d. Return situation to normal	 U 1 min 15 min 10-82 min	 U 1.3 min 4.9 min 35.3 min	 U 45 sec 3 min Vary	 U 30-45 sec 3.5 min Vary	 5-10 min 5-10 min 15-20 min 1-2 hours	 U 1-2 min 1-8 min 15 min	 15 min. 3-15 min. IS-20 min. Vary
8. What problems increase the response time?	●	●	●	●	●	●	●
9. what types of incidents cause response problems?	●	●	●	●	●	●	📬
10. Does stopped traffic on I-65 affect response time? If yes, describe how you adjust your response to enable you to reach the scene of the incident.	Yes ●	Yes ●	No	No	Yes	Yes	✡♏⧫ 📬
1 I. Do traffic problems off I-65 delay/affect response lime? If yes, describe how you adjust your response to enable you to reach the scene of the incident.	●	Yes ●	Yes	No	Yes	Yes	✡♏⧫ ♋
12. What percentage of the incidents are personal/public safety-related (i.e. fire, injury, hazardous waste spill, etc.) rather than mechanical breakdowns?	75-99	0-24	100	75-99	100	75-99	IS-99
13. On what percentage of incident response must a call be made for additional assistance once the primary response team is on the site?	75-99	0-24	0-24	0-24	75-99	0-24	25-49
14. Who is in charge when multiple agencies are involved in incident response?	Each Agency Resp.	Each Agency Resp.	Fire Dept. if Fire	Fire Dept if Fire	Each Agency Resp.	Each Agency Resp.	Police/Fire

LEGEND:

I = Injury Accident	S = Snow	T = Traffic Congestion	W = Weather
HM = Hazardous Material	F = Flooding	U = Unknown	● = Response included in narrative list.
M = Medical Related	H = Highway Maintenance	R = Rescue or Extractions	
F = Fire	B = Mechanical Breakdown	D = Debris	

Table 3.1a
Incident Response Matrix - Kentucky (continued)

QUESTIONS	Louisville Div. of Police	Louisville EMS	Louisville Fire Department	Louisville Fire Dept. (Haz. Mat.)	Louisville/ Jeff. Co. DES	Okolona Fire Dept.	KyTC
15. What problems are encountered in requesting additional assistance?	-	None	None	None	.	•	•
16. Who handles the coordination between responding agencies?	Disp. on Scene	Disp. on Scene	Liaison Officer	Request. Agency	DES	Commander	Police/Fire Dept.
17. Would the presence of an area-wide coordinating agency be beneficial to the response process? If yes describe below.	No	No	No	No	Yes	No	
18. How many responses involve medical treatment at the site?	N/A	4550%	Substan. No.	UNK	UNK	40%	40%
19. What types of response staff problems exist within your agency?	None	None	None	None	None	Volunteer Avail.	Need More Staff
20. What types of aid are received from contracted private companies?	Towing EMS	Backup Ambl.	None	Clean up Company	Towing	None	Towing Haz. Mat.
21. What types of citizen involvement are related to the response of incidents on I-65?	•	•	None	None	None	Initiate Call	•
22. What incident response equipment is available to your agency?	.	.	Any Needed	.	•	•	•
23. What past incidents or types of incidents have caused major problems in response? Describe problems.	•	•	None	•	None	•	•
24. Are there alternate route plans available for diverting traffic off of I-65 during major incidents?	No	Limited	No	No	UNK	Yes	No
25. How is your agency notified of an incident needing response?	Tel.	911 Radio Ringdown	911 or Direct Call	911 or Tel Radio	Paged by F.D.	Jeff Co. Disp.	Police Dept.
26. What type of communication system does your response team have?	Radio, CB, Cell.	Radio	Radio, Cell.	Radio. Cell.	800 MGH Radio	Radio, Cell.	Radio
27. What kinds of information does your agency have to assist you with your response (i.e., traffic control, other)?	•	•	•	•	None	•	•
28. Other comments:	None	None	None	•	None	Phones on I-System	•

LEGEND:

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HM = Hazardous Material	F = Flooding	U = Unknown	• = Response included in narrative list.
M = Medical Related	H = Highway Maintenance	R = Rescue or Extractions	
F = Fire	B = Mechanical Breakdown	D = Debris	

Table 3.1b
Incident Response Matrix - Indiana

QUESTIONS	IN State Police Dept.	Clarksville Police Dept.	Operation Life (Clark Co. EMS)	Clark Co. Sheriff's Dept.	Jeff. Police Dept.	Jeff. City Engineer	Indiana DOT	Clarksville Street Dept.	Jeff. Fire Dept.	Sellersburg Fire Dept.
1. Does your agency respond to incidents on I-65?	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes
2. If yes, approximately how many incidents does your agency respond to each month?	20+	20+	20+	20+	11-20	0	6-10	0-5	0-5	0-5
3. What types of incidents does your agency respond to?	All	All	I	All	All	None	D, S, F	Animals	F, HM	F, HM, R
4. What types of incidents does you agency NOT respond to?	None	N/A	Any Non-injury	None	Non Jurisdic.	None	None	---	Medical	None
5. To whom is your agency responsible? To whom does it report?	State of	City of	Clark	Clark	City of	None	INDOT	City of	City of	State Fire
6. What type of records are kept regarding incident response?	Detail	Detail	Incident	Radio	Detail	None	Daily	None	Firepro	Firepro
7. What is the average response time to an incident on I-65? a. Occurrence to notification b. Notification to dispatch c. En route average d. Return situation to normal	 U 4 sec 3 min 2 min	 5-10 min 1 min 1-5 min Vary	 1 min 1 min 1 min 60 min	 1-2 min 1-2 min 10-15min 30 min	 3-5 min 1 min 3-5 min 30 min	 None	 30 min 5 min 30 min Vary	 U 0-30 min 5-10 min 30 min	 U 1 min 2-3 min 30 min	 4 min 5 min 1 min 10-20 min
8. What problems increase the response time?	•	•	•	•	•	None	•	•	•	•
9. What types of incidents cause response problems?	N/A	•	None	•	•	None	•	---	•	•
10. Does stopped traffic on I-65 affect response time? If yes, describe how you adjust your response to enable you to reach the scene of the incident.	No	Yes	Yes	Yes	Yes	None	No	No	Yes	Yes
11. Do traffic problems off I-65 delay/affect response time? If yes, describe how you adjust your response to enable you to reach the scene of the incident.	No	Yes	Yes	Yes	Yes	None •	No	---	No	No
12. What percentage of the incidents are personal/public safety-related (i.e. fire, injury, hazardous waste spill, etc.) rather than mechanical breakdowns?	74-50	0-24	0-24	50-74	75-99	None	100	0-24	75-99	50-74
13. On what percentage of incident response must a call be made for additional assistance once the primary response team is on the site?	75-99	0-24	0-24	25-99	50-75	None	0-24	0-24	25-49	0-24
14. Who is in charge when multiple agencies are involved in incident response?	Police	Initial Respond. Agency	EMS Manager @ Scene	Officer 1st on Scene	Officer 1st on Scene	None	State Police	Police or Fire	1st Fire Unit on Scene	On Scene

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U = Unknown
R = Rescue or Extractions
D = Debris
W = Weather
• = Response included in narrative list.

Table 3.1b
Incident Response Matrix - Indiana (continued)

QUESTIONS	IN State Police Dept.	Clarksville Police Dept.	Operation Life (Clark Co. EMS)	Clark Co. Sheriffs Dept.	Jeff. Police Dept.	Jeff. City Engineer	Indiana DOT	Clarksville Street Dept.	Jeff. Fire Dept.	Sellersburg Fire Dept.
15. What problems are encountered in requesting additional assistance?	•	•	None	•	Jurisd.	None	Employee Avail	None	None	•
16. Who handles the coordination between responding agencies?	Disp.	On Scene	On Scene	Agency On Scene	Agency On Scene	None	Police	Police	Central Alarm	Incident Comm.
17. Would the presence of an area-wide coordinating agency be beneficial to the response process? If yes describe below.	No	No	No	No	Yes	None	No	No	No	Yes
18. How many responses involve medical treatment at the site?	4%	None	All	20%	30%	None	<5%	None	50%	Most Accid.
19. What types of response staff problems exist within your agency?	Not Enou	None	None	Lack of	None	None	None	None	None	--
20. What types of aid are received from contracted private companies?	Medical	Ambulance	None	Medical	Wrecker	None	N/A	None	Ambulance	Towing
21. What types of citizen involvement are related to the response of incidents on I-651	Initiate Call	Initiate Call	Initiate Call	?	Initiate Call	None	N/A	None	None	---
22. What incident response equipment is available to your agency?	Any Needed	•	Fire, EMS Police	Medical & Fire	Wrecker Amb,HM	None	•	•	•	•
23. What past incidents or types of incidents have caused major problems in response? Describe problems.	None	•	•	•	•	None	None	•	•	---
24. Are there alternate route plans available for diverting traffic off of I-65 during major incidents?	Yes	No	No	Yes	Yes	None	Yes	No	Yes	Yes
25. How is your agency notified of an incident needing response?	Tel. 911 Trooper	CB, Cell. Radio	911	Tel. Radio	Tel.	None	Tel.	Police Radio,Tel.	Central Alarm	County Disp.
26. What type of communication system does your response team have?	Radio	Radio	800 MHZ Radio	Radio	Radio	None	Pager Disp.	Radio	Radio	Radio Cell.
27. What kinds of information does your agency have to assist you with your	N/A	None	•	•	None	None	Location	None	Chemtron	---
28. Other comments:	•	None	None	None	None	None	None	None	None	None

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Table 3.2
NARRATIVE INCIDENT RESPONSE LIST

QUESTIONS:

(Note: The number corresponds to the number of the question as it appears on the questionnaire.)

8. What types of problems increase response time?

Rush hour traffic
Inclement weather
Blocked roads and ramps
Size of vehicles used
Construction
Determining incident location
Rubber neckers
Other fires at same time
Staff shortage or availability
Question of jurisdiction in which incident occurred
Lack of notification

9. What types of incidents cause response problems?

Multiple incidents in close vicinity
Backups that affect more than one ramp to the scene
Large scale incidents
Construction area incidents
Heavy cargo spills
Hazardous materials due to wind direction blocking route
Incidents that totally block traffic
Hazardous material transfers
Traffic control requirements

10. How do you adjust response to reach the scene when there is a backup on I-65?

Use alternate route on surface streets to nearest access ramp
Use emergency equipment to clear a lane of traffic
Determine best approach route using, CB, **AM** or Division radio networks
Travel against flow on closed lane
Respond in opposite direction and cross median
Use shoulders

11. Do traffic problems off I-65 delay/affect response time? If yes, describe the nature of the problems and how you adjust your response to reach the scene of the incident.

Events that block streets: Parades, Mini Marathon, Festivals

15. What problems are encountered requesting additional assistance?

Response times are increased due to backup
Needed equipment and personnel is not defined for the specific incident
Hazardous Material Agencies from out of town take time to respond
Lack of manpower at agency where help is requested
Availability of assistance requested
No common communication frequency

21. What types of citizen involvement are related to incidents on I-65?

Define location of incidents, number of persons involved
May provide first aid
Radio coverage of incidents
Cellular call in on problems
Some CB reporting of problems

Table 3.2 (continued)
NARRATIVE INCIDENT RESPONSE LIST

22. What incident response equipment is available?

Louisville Police
- 5 expressway assist vehicles
- 4 Medium duty wreckers per shift

Fire Department
- suppression equipment
- rescue equipment
- hazardous material equipment

EMS
- 18 ambulances
- hazardous material decontamination vehicle
- disaster bus and equipment to handle multiple patients
- supply van

DES
- **2** vans

KyTC
- front end loader
- dump trucks
- street sweeper
- signs

Clark Co. Police
- first aid equipment
- hazardous material
- stat flight

Sellersburg Fire Dept.
- 5 Engine Co.
- I ladder truck
- 1 air light & power
- 1 heavy rescue
- 3 tankers
- 1 hazardous material
- 1 rehab safety bus
- 6 command units

INDOT
- traffic control devices
- clean up and repair equipment

23. What past incidents have caused major problems in response?

Multiple agency response incidents that close more than one lane of traffic
Having a duration of greater than 1 hour (l/2 hour in rush period)
Multiple accidents
Aircraft crashes
Hazardous materials
Major truck accidents
Bus accidents with multiple patients
Vehicles operating in emergency lanes and on shoulders
Large animals on the roadway

27. What kinds of information does your agency have to assist you in your response?

That which received from incident reporter
Flexline maps
Hazardous material information
Flares
Traffic control equipment
Mile marker information
En route instructions
Maps
Information from on scene agencies responding first
Information from other support agencies

28. Other Comments

New bridge could divert traffic and hazardous materials out of downtown Louisville.

Indiana State Police has full police power and authority to obtain manpower and equipment.

KyTC foremen need car phones and a state vehicle 24 hours a day

3.3 Relationship to Freeway Incident Management

The questionnaires and interviews are useful in identifying existing conditions and opportunities for incident response improvements. Significant comments are summarized below for incident detection, incident response, incident clearance/motorist aid, and motorist information.

Incident Detection

Current Conditions: Most incidents are identified by citizens, with the majority of calls coming via 9 11 using telephones (pay phones or other land line). The Louisville EMS response suggests that 80 percent of incidents are identified in this manner. Some notifications are made by cellular phone or CB emergency channel, and police officers identifying incidents on patrol. Secondary responders are ordinarily notified by police or fire dispatchers.

Fire departments in both Louisville and Indiana typically approach accident scenes from both directions (northbound and southbound) due to uncertainties regarding location and availability of a clear access route.

Suggestions for Improved Incident Management: Better definition of the incident type, location and specialized needs would expedite appropriate action and response of necessary equipment or expertise. Multiple incidents are sometimes difficult to identify.

Incident Response

Current Conditions: In addition to accurate information regarding incident location, nearly all agencies highlight the importance of the existence and awareness of clear access routes. Roadways, lanes (including shoulders), and ramps are often blocked by congestion due to the incident. Other blockages include special events, weather, and construction.

Suggestions for Improved Incident Management: Information regarding access route conditions would improve response time. More median crossover points would be helpful.

Incident Clearance/Motorist Aid

Current Conditions: In Louisville, personnel from different agencies cooperate, but maintain responsibility for their primary function (police, fire, EMS, etc.). In Indiana, the first responder on the scene assumes overall responsibility. Communication occurs through dispatchers. Nearly all agencies agree that an “areawide coordinating agency” is unnecessary and several responded that it would reduce effectiveness. (After clarification, most agree that a central monitoring and information resource could be helpful.)

Suggestions for Improved Incident Management: Develop a centralized incident management resource which provides improved incident detection and serves as an information source for emergency responders. Rather than control, its primary function would be to provide data to agencies as they perform their function. It could also assist in preplanning and could serve as an information source for agencies and groups not directly involved in an incident.

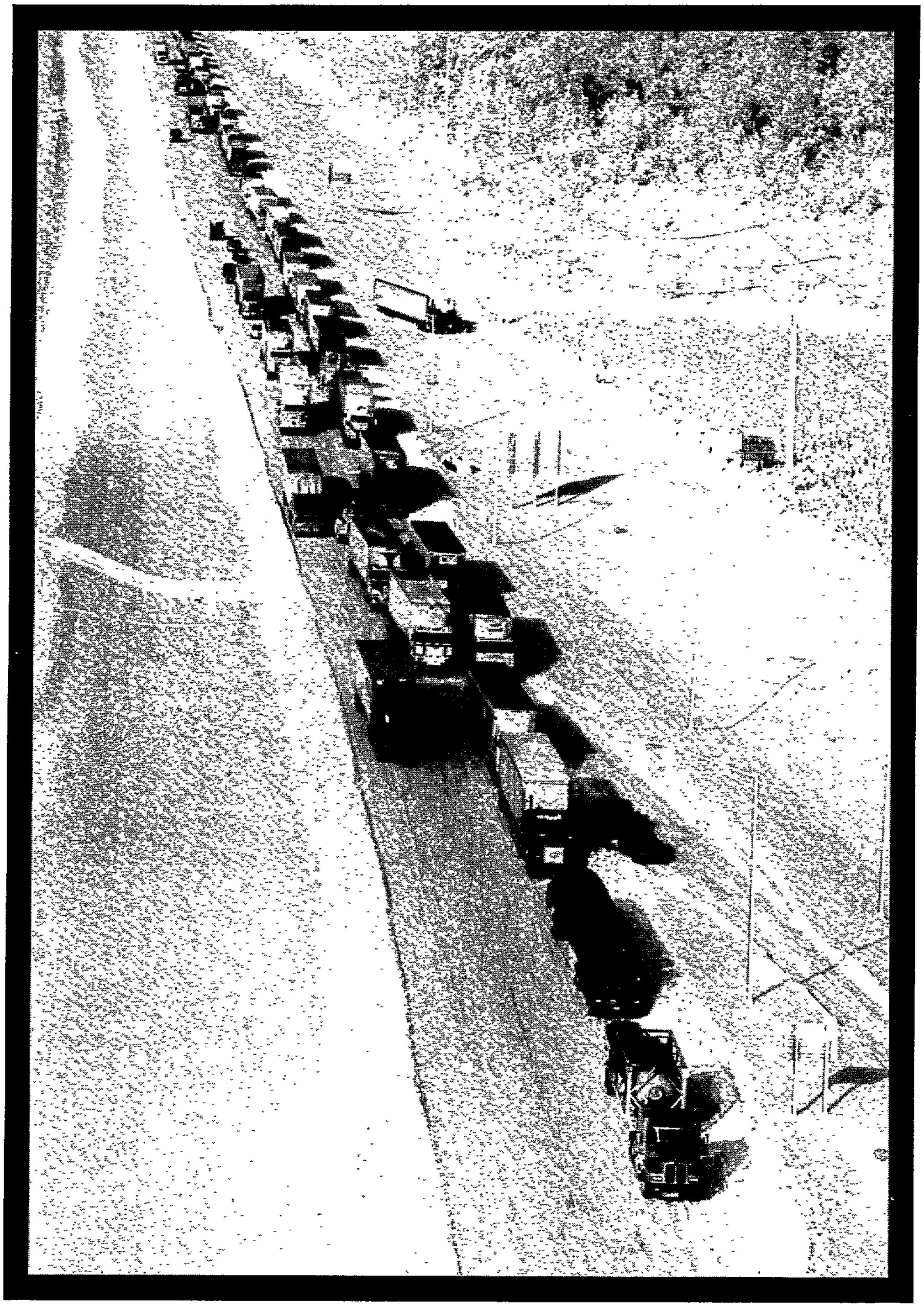
Motorist Information

Current Conditions: Motorist information is provided by public media and officers on the scene.

Suggestions for Improvement: Provide a centralized information source and information links for public media. Advise motorists of downstream incidents and identify potential means to avoid them.

In combination with transportation system characteristics presented in Section 2, this incident response information represents a key determinant of appropriate components for an incident management system for the Metropolitan Louisville area. The next section reviews equipment and policy options which might be a part of the system.

4. POTENTIAL IMPROVEMENT OPTIONS



Source: The Courier-Journal

January 19, 1994

Worst snow storm in Kentucky history turns I-65 into a parking lot for stranded motorists.

4. POTENTIAL IMPROVEMENT OPTIONS

Potential improvement options for a freeway incident management system range from capital and operating expenditures to institutional and jurisdictional measures. A wide variety of options are used successfully elsewhere. Although all may not be applicable to I-65, it is useful to review them prior to selecting a recommended system for the Metropolitan Louisville area.

Potential system components can be categorized by the incident management process: detection and verification, response, site management, clearance, and traveler/motorist information. This section provides information on potential options considered for the Metropolitan Louisville area. Chapter 5 provides descriptions of the options that are recommended for the I-65 Freeway Incident Management Plan.

4.1 Incident Detection and Verification Options

The sooner an incident can be detected and verified on the freeway, the less impact the incident will have on the normal flow of traffic. The following options for detection and verification may be used to bring an incident to the attention of the responsible agencies or authorities:

- **Dedicated Freeway/Service Patrols** are important in areas where timely incident detection and response is particularly critical or where other electronic detection equipment is not available. Many minor accidents and incidents can be cleared with the patrol vehicle, eliminating the cost and delayed response of tow trucks. The supplies carried by service patrols are sufficient to clear many incidents related to vehicle breakdown. In addition, push bumpers mounted on the service vehicle allow for quick clearance of small accidents. Also, once the patrol stops at an incident scene, its detection capability on the rest of the freeway is eliminated. Several private companies have successful organized service patrols. They train the personnel, equip the vehicles, and operate the service. Other freeway/service patrols are operated in a similar manner by transportation agencies.

- **Motorist Aid Call Boxes/Telephones** are appropriate in isolated areas, where detection times are lengthy. Reporting can be done 24 hours a day directly to the responding agency. (It should be noted that motorist aid call boxes on I-65 were removed from service 1977 due to vandalism and lack of use for their intended purpose.)

- **Incident Reporting with Cellular Telephones** is similar to a “911” system, but uses a different phone number. In many cases these systems can be monitored by existing dispatch staff, requiring no special training. Motorists usually provide timely information about a particular incident. However, the use of the system is limited to cellular telephone owners, the workload of the dispatcher is increased dramatically, and roadside signs are required to inform motorists of the system. Capital, operating and maintenance costs are relatively low and the benefits are generally high. To increase these benefits, cellular telephones should be distributed to KyTC and INDOT personnel who frequently use the freeway during commuting hours in return for calls at regular intervals to track travel speeds and report incidents. This technique has been successful in the Boston area.

- **Citizens' Band (CB) Radio Monitoring** is similar to the cellular telephone system. These communications, over a dedicated CB channel, can be monitored by service patrol vehicles on patrol as well as by existing police dispatchers. Multiple transmissions will help to verify and locate the incident. Much of this potential is focused on the truck driver. As with the cellular system, there will be an increased workload for the dispatcher, and roadside signs are necessary to inform the CB user of the system.

- **Volunteer Watch** involves citizen observation of the freeway from vantage points in high incident areas or directly in vehicles calling in observations on a periodic time basis. The advantages of a volunteer watch include visual verification and initial assessment of the incident. Disadvantages might include lack of available volunteers for a particular high incident area, as well as the need for training or instruction to acquire reliable information. A successful informal program has been established in conjunction with the northern New Jersey Freeway Management System.

- **Ties with Transit/Taxi Companies** can take advantage of vehicles already on the road with two-way radio communications. This method of detection would be expanded to cover the entire city street system in addition to local freeways. Travel times and roadway conditions could be determined from TARC's Automatic Vehicle Location/Automatic Vehicle Monitoring equipment, which has been installed on some of their fleet. This method of detection and verification requires very little training. Incident data would be reported to the transit or taxi dispatcher and relayed to the traffic operations center. The dispatcher would then relay the information to the appropriate agency. This improves the efficiency of the transit/taxi operations in that the dispatcher shares the information with the other vehicle operators. This is a very low cost solution and, if properly executed, would produce significant benefits.

- **Aircraft Patrols** are currently being used in the Metropolitan Louisville area for commercial radio traffic updates. This method has potential for monitoring shifts in traffic to diversion routes and visually analyzing traffic distributions. One disadvantage of patrols is the high cost, which typically limits patrols to peak periods. The aircraft patrol would provide timely information by calling directly into the traffic operations center. Data compiled at the TOC would be made available to the operators of the aircraft patrols and as well as to operators of vehicle probes providing information to the TOC. Since these types of commercial patrols are not funded by the transportation agency or police, the exchange of information can result in a high return.

- **Electronic Detection** includes inductance loops, radar detection units, infrared detection units, microwave detection units, and video imaging detection systems (VIDS). These systems vary in cost, accuracy, and proven reliability. Traffic flow information collected by these devices is sent through a communications link (leased telephone lines, twisted pair wire, or fiber optic cable) from the detector's roadside processor to a central computer with incident detection software. The advantages of electronic systems include 24-hour operation and traffic data collection capability. Some disadvantages are high initial cost, false alarms, and potentially high maintenance costs.

- **Closed-Circuit Television** (CCTV) provides quick incident assessment, and promotes proper response to incidents. This system also provides a method to record selected incident response activities for later review. Full system coverage of the freeway would require approximately one camera per mile plus additional cameras at interchanges. Manually monitoring these cameras is ineffective. Cameras can be linked directly to detection subsystems to automatically activate an alarm and call up the appropriate camera. Other potential users of a fiber optic cable system, such as the University of Louisville, should be contacted for the potential of shared funding.

- **A Traffic Operations Center (TOC)** is a central information processing and control site. In a multi-jurisdictional situation, it is advisable to develop one overall TOC, providing better service than several uncoordinated centers. Since the primary function of TOC is information sharing, it is best to link its operations with existing agencies. Ideally, it would include all of the decision makers involved in a major incident, especially the local police command center. Some of the service patrol vehicles and personnel could also be housed at this center.

4.2 Response Time Improvement Options

Identifying the proper response to an incident and getting the appropriate equipment to the scene as quickly as possible are the keys to efficient and reduced response times. Interagency communications and cooperation are very important where fast response is needed.

- **Personnel, Equipment, and Materials Resource Lists** provide information on who should respond in each particular segment. Police, fire, EMS, transportation, media, and private agency contacts as well as the method of communication would be specified. Radio channels and telephone numbers should be clearly identified. This list would be distributed to the appropriate responding agency personnel. The same type of list would be compiled for equipment and materials in the area. These relatively inexpensive tools will save time and effort in the event of an incident.

- **Dedicated Freeway/Service Patrols** - see Section 4.1

- **Personnel Training Programs** emphasize the coordination aspect of incident response, making each agency aware of the other agencies' needs and requirements. A demonstrated willingness to participate and cooperate is required by all agencies if the incident response team approach is to be successful.

- **Revised Tow Truck/Removal Crane Contracts** may be established with private firms to reduce the response times at frequent incident locations, and to allow immediate use of necessary equipment. These contracts eliminate the question of who to call when specific equipment is required. Agency owned tow trucks are typically costly to purchase and operate. Private contracts offer financial incentives for the tow truck company to clear the freeway as quickly and safely as possible. The agreements developed by Fairfax County, Virginia are one example of successfully applying this option. Heavy duty wreckers to be stationed at key points allow for the quick removal of major equipment, debris, and spills. Generally these are warranted for short sections (usually bridges and tunnels) with high truck volumes.

- **Improved Interagency Radio Communication** may require the purchase of compatible two-way radio equipment and the use of a common nomenclature or terminology. This would improve site management and provide better information to the respondent personnel. However, it may not be feasible for all agencies to participate and to invest in new equipment. Costs vary depending on specific equipment needs. Command posts may be needed at incidents where two or more agencies are involved. This facilitates communications and saves time by reducing repetition of commands.

- **Ordinances Governing Travel on Shoulders** will be possible only in areas where shoulder widths are wide enough for emergency equipment. It would be a wise decision to incorporate sufficient shoulder widths in the design of the I-65 widening project in Indiana.

- **Emergency Vehicle Access,** such as movable barriers and U-turns at key locations along the freeway, reduce response times for emergency vehicles. These techniques are useful for response vehicles when one direction of the highway is completely blocked and access is only possible by approaching the scene contra-flow to the travel direction. However, unauthorized motorists may be tempted to use these U-turn facilities, and movable barriers are expensive.

- **Diversion Route Planning** is useful when the capacity of the freeway is reduced by an incident. It is important to plan routes that avoid low overpasses or severe turns. Either temporary or permanent signing is required at junctions and along the route to reduce confusion and provide for smooth traffic flow. Use of VMS and/or HAR to inform motorists of the alternate route is very effective.

- **Equipment Storage Sites** would reduce response times by providing special removal equipment at high incident locations. Costs are minimal if this space already exists, but it may be difficult to find additional space at some high incident areas. Large equipment to be stored might include wreckers, sand trucks, and other large vehicles. Smaller items include cones, signs, flares, portable barriers, and other equipment for traffic control.

- **Administrative Traffic Management Teams** include officials from transportation, police, fire, and rescue agencies, such as the Working Committee for the I-65 Freeway Incident Management Study. This strategy requires a willingness to cooperate by all participating agencies. The intent is to provide a forum for discussion of unresolved incident management issues, preplanning for response, and improved communications.

- **Public Education Programs** inform motorists of their rights and responsibilities when they are involved in a traffic accident. Motorists are allowed to move vehicles from the scene of an accident according to Kentucky or Indiana law, but they are precluded from doing so by Louisville city ordinance. Most are reluctant to do so in any case because of misconceptions regarding the legality or liability of the action.

- **Traffic Operations Center - see** Section 4.1

- **Closely Spaced Reference Markers,** as well as other landmark and directional markers, help in locating incidents. These markers aid cellular telephone callers in reporting incidents, and provide improved record keeping for analysis of incidents. The markers would be located on the center median barrier to enhance visibility and reduce costs. For ramps and collector-distributor roadways, special numbering, colors, and/or patterns would be necessary, due to the potential for confusion. Utility poles might also be designated with markers to identify locations along the freeway. These markers might be placed every l/10 of a mile or every 2/10 of a kilometer.

4.3 Site Management Options

Incident clearance can become more effective if the site management techniques are well executed. Coordination of personnel and control of traffic help to reduce the likelihood of secondary accidents.

- **Incident Response Teams** would be comprised of personnel from various agencies. These teams would be trained to handle unusual incidents and would be familiar with one another. Incident response teams might improve site management and clearance efforts in special circumstances, but they are likely to be ineffective if not properly trained and equipped. For large scale HAZMAT incidents, Kentucky currently has an incident management team composed of police, fire, EMS and DES representatives.

- **Personnel Training Programs - see** Section 4.2

- **Improved Interagency Radio Communications** - see Section 4.2

- **Properly Defined Traffic Control Techniques** are standard guidelines for lane closure which are identified and agreed to in advance. The guidelines should be consistent with FHWA's Manual on Uniform Traffic Control Devices and any superseding state guidance. This action requires cooperation among agencies. The incident management team would provide an appropriate forum for this activity,

- **Properly Defined Parking for Emergency Response Vehicles** is a technique of identifying in advance the appropriate place at anincident site for placement of response vehicles. This placement depends on the nature of the incident. As with the traffic control techniques, this is a cooperative action. In a related policy, Seattle recommends that emergency vehicles be positioned so as to close no more travel lanes than those already blocked by the incident.

- **Flashing Lights Policy** would be considered to reduce distraction to non-involved motorists. Flashing lights may not be required when the respondent vehicles are on the shoulders. The drawback is that the response team members may not feel as safe. Some field testing may be necessary to get reactions from incident response team members and the public, and some legislative work may need to be done.

- **Administrative Traffic Management Team** - see Section 4.2

- **Traffic Operations Center** - see Section 4.1

- **Diversion Route Planning** - see Section 4.2

- **An Incident Response Manual** would be developed to increase the efficiency at the incident site. Input by all involved agencies is required to produce a document that accurately defines all procedures for site management. It should be specific to the facility, roadway or corridor it deals with. Frequent updating and training is also required.

4.4 Clearance Time Reduction Options

- **Policy Requiring Fast Removal of Vehicles** is a low cost method of returning the roadway to normal operating conditions where shoulders exist or where there is adequate space for a holding area. Liability may be an issue if damage to the disabled vehicle occurs. Generally, however, this policy has no cost to the transportation agencies, and would make police and other response personnel available to perform other more important duties. This is a low cost, high benefit solution which reduces the number of responses, but it may be difficult to change motorists' behavior. Additional information on this subject is included in Appendix D.

- **Accident Investigation Sites** allow operable vehicles involved in non-injury accidents to be removed from the travel lanes immediately. In many situations, secondary accidents occur due to blockage of travel lanes. With the use of off-road or out-of-sight Accident Investigation Sites, secondary accidents are less likely. Accident Investigation Sites are used to interview those involved, fill out police reports, and make necessary telephone calls. The area should be flat and well lighted with a telephone or call box. Finding an appropriate location may be difficult, and site preparation, signing, and publicity will require a degree of investment. Clearly displayed signs along the freeway are needed to inform motorists of accident investigation sites. Additional information on this subject is included in Appendix D.

- **Dedicated Freeway/Service Patrols** - see Section 4.1

- **Push Bumpers** can be added to the tow trucks, freeway service patrols and police vehicles. They are especially beneficial for quick clearance along elevated roadways and sections with inadequate shoulder widths, such as on most of the I-65 corridor.

- **Responsive Traffic Control Systems,** such as the system currently under design for the City of Louisville, will aid in diversion routing. When diversions become necessary, the traffic operations center will notify the City to implement a pre-determined traffic signal timing plan which will provide more capacity to the diversion route.

- **Ordinances Governing Travel on Shoulders - see** Section 4.2

- **Emergency Vehicle Access** - see Section 4.2

- **Diversion Route Planning** - see Section 4.2

- **Incident Response Teams** - see Section 4.3

- **Personnel Training Programs** - see Section 4.2

- **Incident Response Manual** - see Section 4.3

- **Administrative Traffic Management Teams** - see Section 4.2

- **Public Education Program** - see Section 4.2

- **Total Station Accident Investigation Equipment** is a combination of electronic surveying and distance measuring devices developed exclusively for the investigation of accidents. This type of equipment reduces delays, personnel requirements and exposure of personnel to traffic hazards since accident investigations can be carried out more quickly.

4.5 Traveler/Motorist Information Options

- **Highway Advisory Radio** (HAR) is a powerful instrument to share information with travelers in their automobiles. Information regarding planned lane closures due to construction or maintenance is broadcast repeatedly over the HAR. Advanced warning to motorists of lane closure schedules, incidents, or special events will help to reduce the traffic demand at the closure, and may reduce the number of accidents in the area. Two HAR transmitters would be needed to provide coverage for motorists in and around the Metropolitan Louisville area. If a high power transmitter is used, motorists can be informed prior to their trip.

- **Variable Message Signs (VMS)** are used alone and in conjunction with HAR to inform motorists of planned lane closures, incidents and special events. Truck mounted or trailer mounted VMS can be very effective in incident management. These can be located and moved in response to a major long term incident.

- **Traffic Operations Center** - see Section 4.1

- **Commercial Radio and Television Broadcasts** are good sources of information for the traveling public in most cases. Commercial radio is a well known source for traffic information in the Metropolitan Louisville area. In some communities, commercial broadcasts have been known to provide outdated or incorrect information.

- Kiosks, for special traffic generators such as Standiford Field, Kentucky Fair and Exposition Center, and Churchill Downs, could be used to inform motorists of traffic conditions. On-screen graphics and text could convey accident and incident information, travel times, or even provide suggestions for the best route to a motorist's destination.

- **PC/Modem** systems could be used to tap into the Traffic Operations Center's computer from home or work. A telephone hotline would be established so that travelers could call in for conditions on I-65. A caller would enter the entry and exit interchange number on his key pad and the direction of travel. The computer would dispatch information to the caller on current roadway conditions. Private sector firms could become involved in establishing this service.